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CONDUCTED BY
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"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini, ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exculta; malè doctis et barbaris semper inimica fuit."—LINNÆUS.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRUCKNER, *Théorie du Système Animal*, Leyden, 1767.

. . . . The sylvan powers
Obey our summons; from their deepest dells
The Dryads come, and throw their garlands
And odorous branches at our feet; the Nymphs
That press with nimble step the mountain-thyme
And purple heath-flower come not empty-handed,
But scatter round ten thousand forms minute
Of velvet moss or lichen, torn from rock
Or rifted oak or cavern deep: the Naiads too
Quit their loved native stream, from whose smooth face
They crop the lily, and each sedge and rush
That drinks the rippling tide: the frozen poles,
Where peril waits the bold adventurer's tread,
The burning sands of Borneo and Cayenne,
All, all to us unlock their secret stores
And pay their cheerful tribute.

J. TAYLOR, *Norwich*, 1818.

ALERE FLAMMAM.

CONTENTS OF VOL. II.

[ELEVENTH SERIES.]

NUMBER 7.

Page

I. On the Australian *Orussidæ*, with a Key to the Genera of the World (Hymenoptera, Symphyta). By Robert B. Benson, M.A., Department of Entomology, British Museum (Natural History) .. 1

II. On some Anthidiine Bees (Apoidea) from Palestine. By G. A. Mavromoustakis, Limassol, Cyprus 15

III. Some *Laccophyllidæ* from the Middle Devonian of Bohemia. By Ferdinand Prantl, R.N. Dr., Department of Geology, National Museum, Prague. (Plates I.-III.) 18

IV. New Brazilian *Curculionidæ* (Col.). By Sir Guy A. K. Marshall 42

V. Some Notes on Stag-beetles (*Lucanidæ*) and Descriptions of a few new Species. By Gilbert J. Arrow (British Museum (Natural History)). (Plate IV.) 49

VI. On *Barbus wohlerti*, sp. n., the "Zwergsichel-Barbe" of German Aquarists. By Ethelwynn Trewavas, D.Sc., Assistant Keeper in the British Museum (Natural History) 63

VII. Some new Termitophilous Spiders from Brazil. By W. S. Bristowe, M.A., Sc.D. 67

VIII. Importance of Colour-pattern in the Phylogeny of certain Barbets. By J. D. Macdonald, B.Sc., Department of Zoology, British Museum (Natural History) 73

IX. A new Fish of the Genus *Selenotoca*. By A. Fraser-Brunner 76

X. Notes on the Species of *Barbus* from the Cape Province, with Descriptions of new Species. By K. H. Barnard, D.Sc., F.L.S., South African Museum 80

NUMBER 8.

XI. The Osteology of *Zaprora silenus* Jordan, with Notes on its Distribution and Early Life-history. By Wilbert M. Chapman and Lawrence D. Townsend, State of Washington, Department of Fisheries 89

XII. Sawflies of the Subfamily *Trichorhachinæ* (*Argidæ*) (Hymenoptera, Symphyta). By Robert B. Benson, M.A., Department of Entomology, British Museum (Natural History) 117

XIII. Asiatic Species of *Microphanurus* (Hym., Proctotrupoidea). By G. E. J. Nixon, B.A., Imperial Institute of Entomology 122

XIV. Balanophyllias from the Cape of Good Hope. By C. J. van der Horst, University of the Witwatersrand. (Plates V. & VI.) 139

Page

XV. Descriptions and Records of Bees.—CLXIX. By T. D. A. Cockerell, University of Colorado 146

XVI. Notes on British Eocene and Pliocene Terebratulas. By Helen M. Muir-Wood, D.Sc., F.G.S., Department of Geology, British Museum (Natural History) 154

XVII. Melichar's 'Monographie der Cicadellinen.' By W. E. China, M.A., Department of Entomology, British Museum (Natural History) 182

XVIII. Papers on Oriental *Carabidæ*.—XXXIV. By H. E. Andrewes 185

XIX. Stray Notes on Mallophaga. By G. H. E. Hopkins, M.A. 191

XX. On a new Genus of the *Pleurogenetinæ* (*Lecithodendriidæ*, Trematoda) from a Kingfisher. By B. P. Pande, Zoology Department, University of Allahabad, India... 199

XXI. A new Corsican Trichopteron. By Martin E. Mosely, F.R.E.S., F.Z.S. 204

XXII. Some Ordovician Bryozoa (Polyzoa) from Akpatok Island. By Kenneth P. Oakley, B.Sc., Ph.D., F.G.S., Department of Geology, British Museum (Natural History). (Plates VII.–IX.) .. 206

XXIII. Results of the Oxford University Expedition to Sarawak (Borneo), 1932. *Acridiidæ* (Orthoptera). By C. Willemse, Eygelshoven, Holland 217

XXIV. Sawflies of the Family *Tenthredinidæ* in Australia, with the Description of a new Genus and Species (Hymenoptera, Symphyta). By Robert B. Benson, M.A., Department of Entomology, British Museum (Natural History) 236

New Book:—General Biology. A Text-book for College Students. By Professor P. D. Strausbaugh and Professor B. R. Weimar. 239

NUMBER 9.

XXV. New Caradocian Brachiopods from the Berwyn Hills, North Wales. By H. B. Whittington, B.Sc., University of Birmingham. (Plates X. & XI.) 241

XXVI. New and little-known False-Scorpions from the Pacific and elsewhere (Arachnida-Chelonethida). By Joseph C. Chamberlin, Associate Entomologist, U.S. Department of Agriculture, Bureau of Entomology and Plant Quarantine, Corvallis, Oregon .. 259

XXVII. The Coleopterous Genus *Anthypna* (*Glaphyridæ*). By Gilbert J. Arrow, British Museum (Natural History) 285

XXVIII. A Revision of the Fishes referred to the Genus *Canobius* from Lower Carboniferous Localities other than Glencartholm. By J. A. Moy-Thomas, M.A., Department of Zoology and Comparative Anatomy, Oxford 291

XXIX. Helodide et Malacodermes nouveaux d'Afrique [Coléoptères]. Par M. Pic 300

Page

XXX. The Races of the Australian Frog *Hyla aurea* Lesson. By H. W. Parker, B.A., Department of Zoology, British Museum (Natural History) 302

XXXI. New Species of Neuroptera. By D. E. Kimmins, Department of Entomology, British Museum (Natural History) ... 305

XXXII. On a Small Collection of Polychæta from Uruguay. By C. C. A. Monro, M.A., Assistant Keeper in the Department of Zoology, British Museum (Natural History) 311

XXXIII. Two new Oriental Species of *Macrocentrus* (Hym., Brac.). By G. E. J. Nixon, B.A., Imperial Institute of Entomology 314

XXXIV. The Generic Name *Æthalion*. By Errol Ivor White, D.Sc., F.G.S., British Museum (Natural History) 319

New Book:—The Molluscs of South Australia.—Part I. The Pelecypoda. By Bernard C. Cotton and Frank K. Godfrey 319

NUMBER 10.

XXXV. *Bibionidæ* (Diptera) collected by Mr. F. Plaumann in Brazil. By F. W. Edwards 321

XXXVI. A Key to the Genera of the Suborder Cyphophthalmi, with a Description and Figures of *Neogovea immsi*, gen. et sp. n. (Arachnida, Opiliones). By H. E. Hinton, Junior Curator, University Museum of Zoology, Cambridge 331

XXXVII. The Piaget Collection of Mallophaga.—Part IV. By Gordon B. Thompson 339

XXXVIII. On *Storeus* and *Deretiodes* (Coleoptera, *Curculionidæ*) in Fiji. By Elwood C. Zimmerman, Bernice P. Bishop Museum, Honolulu, T.H. 343

XXXIX. The Mallophaga parasitic on *Musophagidæ* (Plantain-eaters).—I. By Gordon B. Thompson. (Plate XII.) 349

XL. *Hermes dubitatus* and *Hermes diversus* Walker (*Sialidæ*, Megaloptera). By D. E. Kimmins, Department of Entomology, British Museum (Natural History). (Plate XIII.) 354

XLI. Some new Australian Sawflies of the Subfamily *Euryinæ* (*Pergidæ*) (Hymenoptera, Symphyta). By Robert B. Benson, M.A., Department of Entomology, British Museum (Natural History) 358

XLII. *Nelees* Navás 1912, a pre-occupied Name in the *Myrmeleonidæ* (Neuroptera). By D. E. Kimmins, Department of Entomology, British Museum (Natural History) 366

XLIII. The Dermal Tubercles of the Upper Devonian Shark, *Cladoselache*. By Sir Arthur Smith Woodward, F.R.S., and Errol I. White, D.Sc. 367

Page

XLIV. New Palæarctic and Indo-Australian *Lymantriidæ* in the British Museum Collection. By C. L. Collenette, F.R.E.S. (Plate XIV.) 368

XLV. Entomological Expedition to Abyssinia, 1926–7: Coleoptera, *Bostrychidæ*. Par Pierre Lesne, Laboratoire d'Entomologie, Muséum National d'Histoire Naturelle, Paris 387

XLVI. Nouveaux *Apion* (Col., *Curcul.*) du Congo Belge. Par L. Burgeon (Tervueren) 395

XLVII. Trois *Bruchus* L. nouveaux des Indes (Coléoptères). Par M. Pic 399

NUMBER 11.

XLVIII. Results of the Oxford University Expedition to Sarawak (Borneo), 1932. Diptera, *Trypaneidæ*. By F. A. Perkins, B.Sc.Agr., Lecturer in Entomology, University of Queensland. (Plate XV.) 401

XLIX. Notes on the Classification of certain British Fishes. By A. Fraser-Brunner 410

L. New or little-known *Tipulidæ* (Diptera).—LV. Neotropical Species. By Charles P. Alexander, Ph.D., F.R.E.S., Massachusetts State College, Amherst, Massachusetts, U.S.A. 416

LI. The Vertical Distribution of some Reptiles and Amphibians in Southern Ecuador. By H. W. Parker, B.A., Department of Zoology, British Museum (Natural History) 438

LII. New Records of African *Scolytidæ* and *Platypodidæ* (Col.).—54th Contribution. By Carl E. Schedl 450

LIII. On Two Species of Mallophaga from *Phaethon rubricauda roseotincta* (Mathews). By Gordon B. Thompson 458

LIV. New Bees of the Genera *Osmia* and *Megachile* from Cyprus (Hymenoptera, Apoidea). By G. A. Mavromoustakis, Limassol, Cyprus 464

LV. Description d'un *Melibæus* de la faune paléarctique et de deux *Buprestidæ* exotiques. Par A. Théry, attaché au Muséum national d'Histoire Naturelle 473

LVI. On a Second Specimen of *Cryptocellus simonis* Hans. & Sør [Arachnida]. By R. J. Whittick, B.Sc., Department of Zoology, British Museum (Natural History) 479

LVII. The Lice of Petrels.—Part I. The elongate Forms. By Gordon B. Thompson 481

LVIII. Early Development Stages of Copepoda.—II. *Metridia lucens* Boeck. By S. G. Gibbons, Ph.D., F.R.S.E., Naturalist, Fishery Board for Scotland, Aberdeen 493

LIX. New Species of Ants and a new Subgenus of *Dolichoderus* from various Localities. By Horace Donisthorpe, F.Z.S., F.R.E.S., etc. 498

LX. New Species of American Heterocera in the United States Museum (Lepidoptera). By W. Schaus 504

Page

LXI. Report of the Percy Sladen Expedition to Lake Huleh; a Contribution to the Study of the Fresh Waters of Palestine. By ROGER WASHBOURN, B.A., and R. F. JONES, B.Sc. (Plates XVI. & XVII.) 517

New Book:—A Guide to Veterinary Parasitology and Entomology for Veterinary Students and Practitioners. By T. SOUTHWELL, D.Sc., Ph.D., and A. KIRSHNER, M.B., Ch.B., D.T.M. 560

NUMBER 12.

LXII. Notes on the Plecoptera of New Zealand, with Descriptions of new Species. By D. E. KIMMINS, Department of Entomology, British Museum (Natural History) 561

LXIII. A List of the Type-hosts of the Mallophaga and the Lice described from them. By GORDON B. THOMPSON 580

LXIV. New Species of *Chysomelidæ* (Coleoptera) from Africa. By G. E. BRYANT, F.R.E.S., Entomological Assistant, Imperial Institute of Entomology 593

LXV. New and interesting *Acrididæ* (Orthoptera) from Mauretania. By B. P. UVAROV, D.Sc. 599

LXVI. The Piaget Collection of Mallophaga.—Part V. By GORDON B. THOMPSON 607

LXVII. On the Teeth of a new Elasmobranch from the Calciferous Sandstones of Glencartholm, Eskdale, Dumfriesshire. By J. A. MOY-THOMAS, M.A., Department of Zoology and Comparative Anatomy, Oxford. (Plate XVIII.) 612

LXVIII. On a small Collection of Polychæta from Swan River, Western Australia. By C. C. A. MONRO, Department of Zoology, British Museum (Natural History) 614

LXIX. On Eighteen new Lithobiomorphous Chilopods. By RALPH V. CHAMBERLIN, University of Utah, U.S.A. 625

New Book:—British Guiana Papers. Scientific Results of the Oxford University Expedition to British Guiana in 1929. Published for the Oxford University Exploration Club by the Oxford University Press 636

Index 637

PLATES IN VOL. II.

PLATE I. }
II. } Syringaxon and Barrandeophyllum.
III. }
IV. Stag-beetles from India etc.
V. } Balanophyllias from the Cape of Good Hope.
VI. }
VII. Ceramoporella, Spatiopora, and Eridotrypa.
VIII. } Diplotrypa petropolitana (Pander) var. ungava, nov.,
IX. } and Pachydictya coxi, sp. n.
X. Orthis, Wattsella, Resserella, Raymondella, Sampo.
XI. Heterorthis, Reuschella, Sowerbyella, Sampo.
XII. Turacœca scleroderma (Ewing).
XIII. Archichauliodes diversus (Walker) and Protochauliodes dubitatus (Walker).
XIV. New Palæarctic and Indo-Australian Lymantriidæ.
XV. Wings of Trypaneidæ from Borneo.
XVI. Lake Huleh.
XVII. Lake Huleh Polyzoa.
XVIII. Teeth of Antliodus scoticus, sp. n.

THE
ANNALS AND MAGAZINE
OF
NATURAL HISTORY.

[ELEVENTH SERIES.]

"   . per litora spargite muscum,
Naiades, et circùm vitreos considite fontes:
Pollice virgineo teneros hic carpite flores:
Floribus et pictum, divæ, replete canistrum.
At vos, o Nymphæ Craterides, ite sub undas;
Ite, recurvato variata corallia trunco
Vellite muscosis e rupibus, et mihi conchas
Ferte, Deæ pelagi, et pingui conchylia succo."
N. Parthenii Giannettasii, Ecl. 1.

No. 7. JULY 1938.

◆

I. *On the Australian* Orussidæ, *with a Key to the Genera of the World* (*Hymenoptera, Symphyta*). By Robert B. Benson, M.A., Department of Entomology, British Museum (Natural History).

A study of the Australian Orussidæ, with the help of an interesting collection made by Mr. F. E. Wilson, has made it necessary to redefine the genera in this family; a number of new characters are introduced, and the opportunity is taken at the same time to revise my previous conceptions on its classification (1935 *a*). I do not propose now to recognize more than one subfamily. The following key will serve to separate the known world genera, of which *Ophrynopus* Konow and *Stiricorsia* Konow are again recognized as distinct, though redefined. Two new genera are also being erected to contain the Australian species, of which six or seven are dealt with in this paper. Further Australian species almost certainly exist, and should be looked for on beetle-infested timber, because so far as is known the insects of this family are parasites on wood-boring beetles.

For the general morphology of the family reference should be made to the paper by Rohwer (1912) and the introductory chapters of Ross (1937). The last general revision of the species of the family was made by Konow (1905).

Key to Genera.

1. In the fore wing the junction of the basal vein and cubitus coincides with the junction of the latter with the subcosta, so that the discoidal cell is sessile (fig. 9); usually bright metallic blue, green, or purple species.

[Maxillary palps reduced to 1 or 2 segments; labial palps vestigial or absent; ♀ antenna with segment 3 = 4 + 5 (fig. 15); scutellum narrowly rounded behind, without a carina (fig. 12); hind femora about 3 times as long as broad; hind tibia with a single row of teeth on the upper margin; hind tibial spurs unequal in length; hind basitarsus longer than rest of tarsal segments together; tergum 2 shorter than 3 + 4 (in the middle).] .... 2.

In the fore wing the basal vein joins the cubitus some distance from the subcosta, so that the discoidal cell is petiolate (figs. 6, 7, and 8); dark-coloured or red-marked species.

[Mouth-parts except in *Pedicrista* Benson and *Kulcania* Benson are normal, with long 5-segmented maxillary palps (Ross, fig. 68) and 3-segmented labial palps (Ross, fig. 80); ♀ antenna without segments 4 and 5 much shortened except in *Orussus* Latreille, where 3 = 4 + 5 (see figs. 14 and 15); the outer hind tibial spur is nearly twice as long as the inner one except in *Orussobaius*, gen. nov., where the spurs are almost of equal length (*cf.* figs. 16–19); the teeth on the upper side of the hind tibia are well developed except in some species of *Orussus* Latreille and *Orussobaius*, gen. nov.] .... 3.

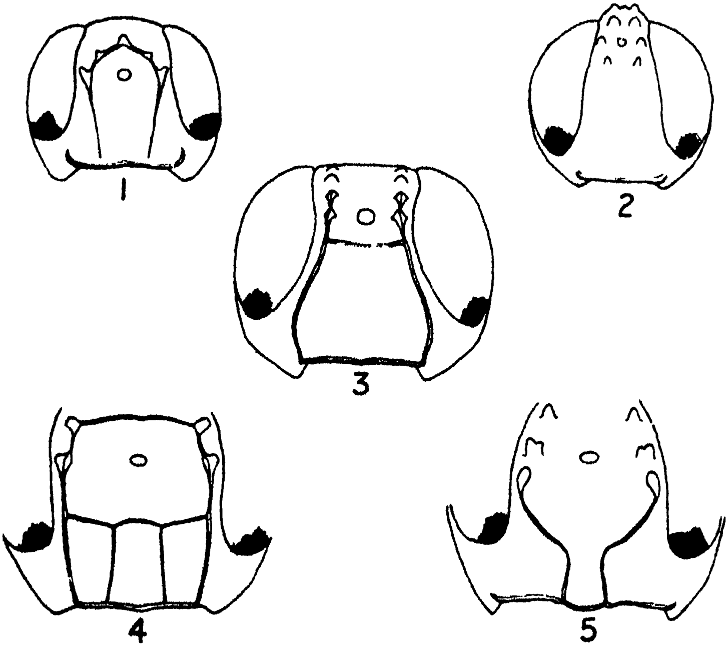
2. **Scape of antenna shorter than the malar space; abdomen cylindrical—the middle segments being scarcely broader than the basal one; face in ♀ with 4 longitudinal carinae in front joined by a transverse carina in front of the anterior ocellus (fig. 4).**

[Type: *M. metallicus* (Mocsáry), Sunda and Ceylon; includes also *M. syriaca*

Benson (1936), Syria, and *M. oberthuri* Saussure, Madagascar.] .... *Mocsarya* Konow.

Scape of antenna longer than the malar space; abdomen distinctly narrowed at the base; in ♀ only 2 longitudinal carinæ on the face; these start from the front tubercles and converge as they approach the keel of the front margin; there is no transverse carina in front of the anterior ocellus (fig. 5).

[The known species, all from Africa, are dealt with by Guiglia (1937). Type: *Chalinus plumicornis* (Guérin).] .... *Chalinus* Konow.



Face, to show arrangement of carinæ in :—

Fig. 1.—*Pedicriata* Benson.
Fig. 2.—*Orussus* Latreille.
Fig. 3.—*Ophrynopus* Konow.
Fig. 4.—*Mocsarya* Konow.
Fig. 5.—*Chalinus* Konow.

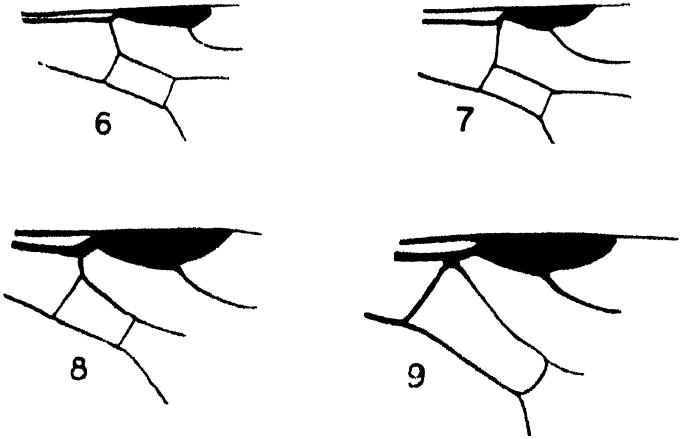
3. Face without carinæ between the eyes; at most the front margin of the face is carinate (fig. 2) .... 4.

Face with 2 longitudinal carinæ and/or with a transverse carina in front of the anterior ocellus (figs. 1 and 3). .... 7.

4. Scutellum triangular or parabolic in shape and with a carinate margin (figs. 10 and 13); radial vein of fore wing received generally at about the middle of the stigma and at most at about ⅔ from the base (figs. 7 and 8) . . . . 5.

Scutellum obtusely rounded behind and without a definite margin (*cf.* fig. 11); radial vein received on the stigma at about ¾ from the base (*cf.* fig. 6).

[Hind femur only about 2½ times longer than broad: 2nd abdominal tergum 3+4; hind tibia with two irregular rows of outer teeth; outer apical spur nearly twice as long as inner; hind basitarsus almost equal to rest of tarsal segments together. Type: *Oryssus nigricans* Cameron, C. America; *Oryssus amazonicus* Westwood also belongs to this genus . . . . *Ophrynella* Ross (1937).



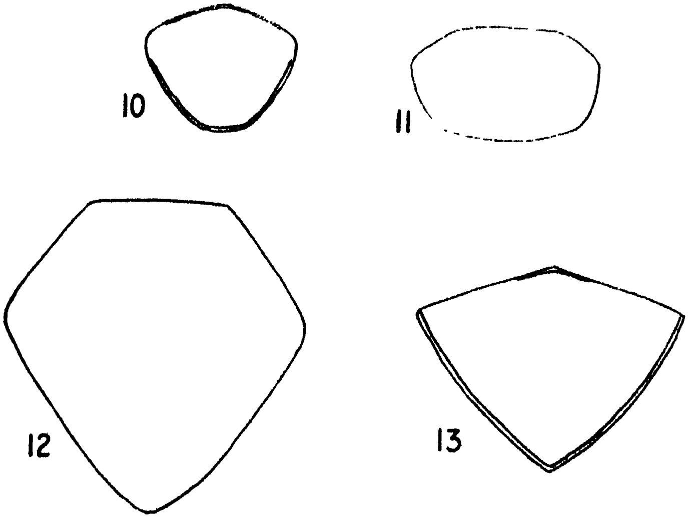
Portion of right fore wing, to show form of discoidal cell and stigma in:—

Fig. 6.—*Ophrynopus* Konow.
Fig. 7.—*Orussobaius*, gen. nov.
Fig. 8.—*Orussus* Latreille.
Fig. 9.—*Chalinus* Konow

5. Front marginal carina of the face not broken in the middle; discoidal cell of the fore wing broader at its base than its apex, the base being longer than the petiole (fig. 8); hind femur at least 3 times as long as broad; inner spur on apex of the hind tibia about ½ the length of the outer one; scutellum generally

subtriangular in shape (fig. 13); 2nd abdominal tergum usually less than 3+4 .... 6.

Front marginal transverse carina to the face absent or at least broken in the middle; discoidal cell of the fore wing with the base and apex equally broad, the base being shorter than the petiole (fig. 7); hind femur swollen, so that it is less than 2½ times longer than broad; apical spurs to the hind tibia almost equal in length (figs. 18 and 19); scutellum parabolic in shape (fig. 10); 2nd abdominal tergum = 3+4.
[Australia. Type: *O. mesembrinus*, sp. n.; 3 spp.] .... *Orussobaius*, gen. nov.



Form of scutellum in:—

Fig. 10.—*Guiglia*, gen. nov.
Fig. 11.—*Stiricorsia* Konow.
Fig. 12.—*Chalinus* Konow.
Fig. 13.—*Orussus* Latreille.

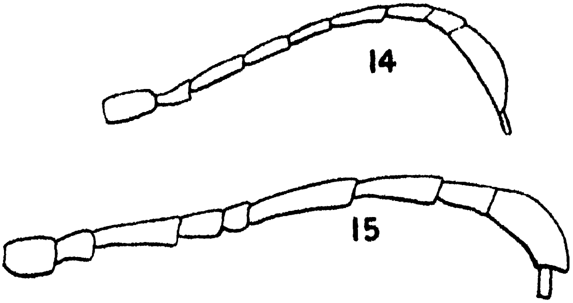
6. Head with only 2 pairs of tubercles in the ocellar region; ♀ antenna with segments 4 and 5 not much shortened, so that 3 and 4 are almost equal in length (fig. 14).
[Chile. Type: *Oryssus dentifrons* Phillips, 1873, monotypic.] .... *Orussella* Benson, 1935.

Head with at least 3 pairs of tubercles in the ocellar region (fig. 2); ♀ antenna with segments 4 and 5 much shortened, so that the length of 3 approximately = 4 + 5 + 6 (fig. 15).

[Holarctic (? Neotropical) (? Oriental), Ethiopian, and Australasian.

The species *O. schoutedeni* Guiglia (Belgian Congo) has a parabolic instead of triangular scutellum; *O. wagneri* De Buysson (1910) (Argentine) is said to have swollen hind femora, oval in shape; these should probably be separated generically from *Orussus*.

The Nearctic species were dealt with by Rohwer (1912); the Palæarctic species are in need of revision; the Ethiopian species have been dealt with recently by Guiglia (1937 *b*). Guiglia (1935) has redescribed *O. loriæ* Mant. from New Guinea and (1937 *c*) has described an *O. bensoni* from the Phillipines. Type: *O. abietinus* Scopoli.] *Orussus* Latreille.



Female antenna in :—

Fig. 14.—*Orussobaius*, gen. nov.
Fig. 15.—*Orussus* Latreille.

7. The longitudinal facial carinæ diverge towards the front, and a transverse carina is usually present cutting off the ocellar region from the frontal area (figs. 3, 25, 26, and 27). . . . . 8.

The longitudinal facial carinæ converge slightly towards the front, and there is no transverse carina separating the ocellar region from the frontal area (fig. 1).

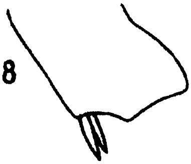
[Mouth-parts much reduced; maxillary palp 4-segmented and labial palp 2-segmented (see fig. 10, Benson, 1935); hind femur 2½ times longer than broad; hind tibia with a single row of 8–9 teeth on its upper side; hind basitarsus about as long as the rest of the tarsal segments together; outer tibial spur about ½ as long as the apical breadth of the tibia; 2nd abdominal tergum shorter than

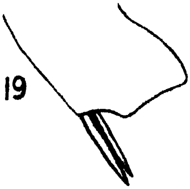
3+4 (in the middle). S. Africa. Type: *P. hyalina* Benson, monotypic.] .... *Pedicrista* Benson, [1935.

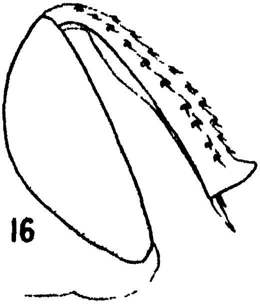
8. 2nd abdominal tergum shorter than 3+4 (in the middle) .... 9.

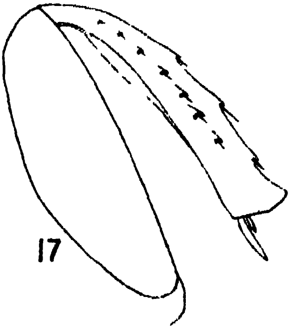
2nd abdominal tergum longer than 3+4.

[Hind femur strongly swollen, nearly ½ as broad as long, so that the hind basitarsus is about as long as the breadth of the femur (fig. 16); scutellum obtusely rounded behind, but without a carinate margin (fig. 11). South and Central America. Type: *O. andrei* Konow; includes also *Oryssus batesianus* Westwood, *fulvostigmus* (Westwood) and ? *mexicanus* Cresson.] .... *Ophrynopus* Konow, [sensu restricto.









Left hind femur and tibia viewed from the left in :—

Fig. 16.—*Ophrynopus fulvostigmus* (Westwood).
Fig. 17.—*Stiricorsia maculipennis* (Smith).

Hind tibial spurs in :—

Fig. 18.—*Orussobaius wilsoni*, sp. n.
Fig. 19.—*O. mesembrinus*, sp. n.

9. **Scutellum semicircular or parabolic and with a carinate margin (fig. 10); thorax opaque, with dense fine sculpture ...... 10.**

Scutellum obtusely rounded behind and without a carinate margin (fig. 11); thorax coarsely punctured, with shining interspaces.

[Hind femur at least 3 times as long as broad (fig. 17). Type: *S. kohli*

Konow (Borneo); includes also *Oryssus maculipennis* Smith (Aru and New Guinea), *Ophrynopus philippinensis* Guiglia (Philippines) and ? *Oryssus tosensis* Nobuyoshi (Japan).] .... [sensu extenso *Stiricorna* Konow.

10. Hind femur swollen, at most 2½ times as long as broad (*cf.* fig. 16); hind basitarsus much longer than the rest of the tarsal segments together; mouth-parts very much reduced (see Bischoff, 1928, fig. 5); maxilla and labium vestigial; maxillary palp of only 3 segments, partly fused, each segment being no longer than broad; labial palp of 1 segment only.

[Central America. Type: *Ophrynopus costaricensis* Bischoff, 1928, monotypic.] .... *Kulcania* Benson, 1935.

Hind femur at least 3 times as long as broad (*cf.* fig. 17); hind basitarsus shorter than the rest of the tarsal segments together; mouth-parts normal, maxillary palp about as long as the front femur and of 5 segments, of which the 3 apical ones are very elongate.

[Australia and New Zealand. Type: *Guiglia bombycinis*, sp. n. (Queensland); includes also *Oryssus queenslandensis* G. Turner (1900) (Queensland), ? *Ophrynopus sericatus* Mocsáry, 1900 (New South Wales), and *O. schauinslandi* Ashmead, 1903 (Chatham Isles and ? New Zealand).] .... *Guiglia*, gen. nov.

ORUSSOBAIUS, gen. nov.

Head without carinæ on the face between the eyes; front marginal carina to frontal area is absent, or at least broken in the middle; ♀ antennal segments 4 and 5 are not much shortened, so that 3 and 4 are almost equal in length (fig. 14); in the ♂ 4 is longer than 3; maxillary palp 5- and labial palp 3-segmented as in *Orussus* (see Bischoff, 1928, fig. 4); there are 2 pairs of tubercles beside the front ocellus and behind the ocellus are transverse ridges to represent 3 other pairs fused; in the fore wing the basal vein joins the cubitus some distance from the subcosta, so that the discoidal cell is petiolate (fig. 7); discoidal cell with base and apex of about equal breadth, otherwise as in *Orussus*; hind femur swollen strongly, so that it is less than 2½ times longer than broad; apical spurs to hind tibia almost equal in length (figs. 18 and 19); scutellum parabolic in shape (*cf.* fig. 10); 2nd abdominal tergum almost equal to 3 + 4 (measured in the middle).

Type: *O. mesembrinus*, sp. n.

Key to Species.

1. Scutellum coarsely punctured, with shining interspaces; hind tibia without definite teeth on upper side (fig. 21) .... 2.

Scutellum dull, with very dense and fine sculpture, without shining interspaces; hind tibia with 2 rows of teeth on upper side (fig. 20).
[Hind tibial spurs shorter than ½ the apical breadth of the tibia (fig. 19); hind femur almost ½ as broad as long.]
Victoria, 7 mm. ♀ .... *wilsoni*, sp. n.

2. Hind femur more than ½ as broad as long; hind tibial spurs shorter than ½ the apical breadth of the tibia (*cf.* fig. 19).
New South Wales, 3 mm., ♂♀ .... *minutus*, sp. n.

Hind femur only about ⅖ as broad as long; hind tibial spurs longer than ½ the apical breadth of the tibia (fig. 18).
New South Wales, 11 to 7·5 mm., ♂♀. *mesembrinus*, sp. n.

Orussobaius mesembrinus, sp. n.

♀♂. Black; brown or piceous are the apices of the femora and the tibiæ. *Wings* hyaline; in the ♀ with the apex of the fore wing from the base of the stigma slightly infuscate, more strongly so in a band under the stigma covering the basal ½ of the radial cell and also at the extreme apex; in the ♂ infuscate only at the extreme apex of the fore wing; stigma and venation black.

Length, ♀ 10 to 11 mm.; fore wing, ♀ 7·5 to 8 mm.; ♂ 7·5 mm.; fore wing, ♂ 5·5 mm.

Head and *thorax* with coarse dense punctures, but on the face, the mesonotum, especially the front of the scutellum, and on the mesopleura there are shining interspaces; the frontal area has a carina each side but not in the middle; the hind ocelli are about ½ their own diameter from the eye margin; hind coxa covered with dense pale pubescence; hind femur swollen so that it is only about ⅖ as broad as long; hind tibia without well-defined rows of teeth above (fig. 21) and the apical spurs more than ½ as long as the apical breadth of the tibia (fig. 19); basitarsus almost as long as the 4 following tarsal segments. *Abdomen* on the basal terga with coarse reticulate sculpture partly covered with finer round punctures; on the apical segments the reticulate sculpture disappears and the round punctures have shining interspaces.

New South Wales, Bogan River, 2 ♀♀ (including holotype) and 1 ♂ taken on dead branch of *Acacia pendula* A. Cunn., x. 1932 (*J. Armstrong*).

(Holotype and allotype in Wilson Coll.; paratype in British Museum.)

Orussobaius minutus, sp. n.

♀♂. Black; red are the legs except the coxæ; in the ♀ the antennal segments 3–6 are brown, and in the ♂ the segments 4, 5, and 6 are more or less piceous. *Wings* hyaline; stigma and venation brown in ♀, black in ♂.

Length, ♂♀, 3·5 mm.; fore wing 2·5 mm.

Head and *thorax* with large coarse punctures on the face about the size of an ocellus; the punctures are dense and the ridges between them form a reticulate surface; on the back of the head and the mesonotum the punctures are smaller, with shining interspaces in places; mesopleuræ dull and irregularly rugulose; frontal carina obscured by the coarseness of the punctures.

Legs with very swollen hind femur, which is even more than ½ as broad as long; tibia without definite teeth on upper side (*cf.* fig. 21); hind tibial spurs shorter than ½ the apical breadth of the tibia (*cf.* fig. 18); hind basitarsus longer than the 3 following tarsal segments.

Abdomen with reticulate and coarse irregular punctures on the 1st tergum, on the other terga the reticulation is confined to the apical ⅔ of each tergum, the basal ⅓ being more sparsely punctured with shining interspaces.

New South Wales, Bogan River, 1 ♀ (holotype) and 2 ♂♂ (*J. Armstrong*).

(Holotype in Wilson Collection; allotype in British Museum.)

Orussobaius wilsoni, sp. n.

♀. Black; brown are the legs (except all the coxæ, the lower side of the hind femur, and the apical tarsal segment); piceous are the 6 basal segments of the antenna, the hind angles of the pronotum, and tegula.

Wings flavo-hyaline; fore wing with 3 transverse fuscous bands: (1) occupying the extreme apex of the wing (including about the apical ⅖ of the radial cell; (2) a darker band under and of the same width as the stigma; (3) stretching only across the middle third of the median and submedian cells; stigma yellow with a fuscous margin; venation yellow, but fuscous where it crosses the fuscous bands.

Length 7 mm.; fore wing 5·2 mm.

Head as in *O. mesembrinus*, sp. n., but with coarse dense puncturation all over without shining interspaces; there is no carina separating the frontal area from the clypeal region; the hind ocellus is about ⅔ its own diameter from the eye-margin.

Thorax dull, with dense puncturation; on the scutellum this is much finer; hind coxa covered in dense silvery pubescence; hind femur very broad, almost ½ as broad as long and with fine coriaceous sculpture; hind tibia above with two parallel rows of about 11 teeth, apical spurs shorter than ½ the breadth of the apex of the tibia (fig. 18); basitarsus longer than the 3 following tarsal segments together.

Abdomen: the first 2 terga are dull, with dense puncturation, partly reticulate; the rest of the terga have similar sculpture on the apical ⅗, but the basal ⅖ of each tergum is more sparsely punctured, with shining interspaces.

VICTORIA, 1 ♀, 8. iii. 1931, Ferntree Gully (*F. E. Wilson*) (type in Wilson Collection).

This species is named after Mr. F. E. Wilson.

GUIGLIA, gen. nov.

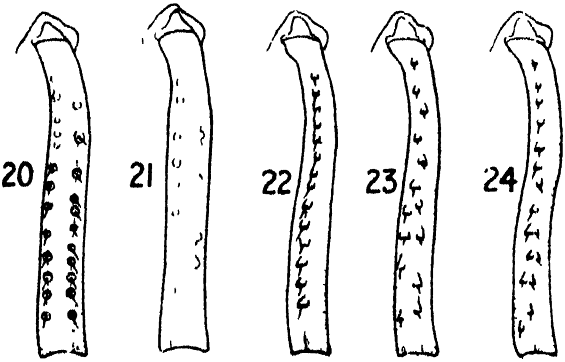
Head with the frontal area surrounded by a carina thus: there is a pair of carinæ on the inner orbits which diverge towards the front; these are joined in front by a transverse carina immediately above the antennæ and generally behind by a transverse carina in front of the anterior ocellus; in *G. schauinslandi* (Ashmead) the last carina is absent; ♀ antennal segments 4 & 5 are not much shortened, so that 3 and 4 are almost equal in length (*cf.* fig. 14); maxillary palp 5- and labial palp 3-segmented as in *Orussus*; there are 4 or 5 pairs of tubercles in the ocellar region; in the fore wing the basal vein joins the cubitus some distance from the subcosta, so that the discoidal cell is petiolate; discoidal cell with base and apex of equal breadth (*cf.* fig. 7), otherwise as in *Orussus*; hind femur at least 3 times as long as broad; inner spur on apex of hind tibia about ½ length of outer one (*cf.* fig. 17); scutellum parabolic in shape (fig. 10); 2nd abdominal tergum less than 3+4 (in the middle).

Type: *Guiglia bombycinis*, sp. n.

This genus is named after Dr. Delfa Guiglia of the Museo Civico di Storia Naturale, Genova.

Key to Species known to me.

1. Transverse carina in front of the anterior ocellus present (figs. 25 and 26); hind femur pale apically; stigma at least yellow basally; ♀ abdomen with at least 2 apical terga clothed in fine yellow pubescence .... 2.



Left hind tibia viewed from above:—

Fig. 20.—*Orussobaius wilsoni*, sp. n.
Fig. 21.—*O. mesembrinus*, sp. n.
Fig. 22.—*Guiglia bombycinis*, sp. n.
Fig. 23.—*G. queenslandensis* (G. Turner).
Fig. 24.—*G.* ? *schauinslandi* (Ashmead).

Transverse carina in front of the anterior ocellus is broken down (fig. 27); legs and stigma entirely black; ♀ abdomen without pale pubescence on apical segments.

[Wings with basal ⅔ hyaline and apical ⅓ fuscous; upper side of hind tibia with the 8 or so basal teeth in a single row, and with 2 rows of 4 apical ones (fig. 24).]

Chatham Islands and ? New Zealand. * ? *schauinslandi* [Ashmead.

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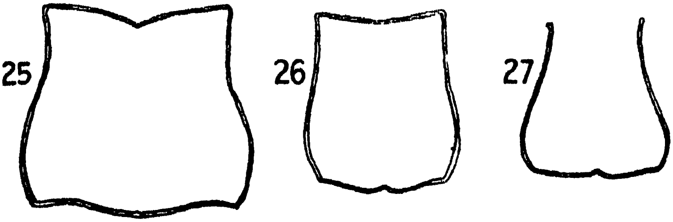
* My description is taken from 1 ♂ and 1 ♀ collected at Tisbury, New Zealand, 28. xi. 1915. These may not be really conspecific with Ashmead's type from the Chatham Islands.

2. Carinated frontal area longer than broad (fig. 26); teeth on upper side of hind tibia in a single row of about 14 teeth (fig. 22); ♀ with the pale silky clothing confined to terga 7 and 8; ♀, fore wing with 3 hyaline bands.
N. Queensland .... *bombycinis*, sp. n.

Carinated frontal area about as long as broad (fig. 25); upper side of hind tibia with the 6 basal teeth single and the 4 apical ones paired (fig. 23); ♀ with pale silky clothing on almost the whole of terga 6, 7, and 8, and with a pair of lateral patches on terga 2, 3, 4, and 5; ♀ fore wing with only 2 hyaline bands, the extreme base being fuscous.
[Turner (Oct. 1900).
N. Queensland .... *queenslandensis*, G.



Carina on frontal area in :—

Fig. 25.—*Guiglia queenslandensis* (G. Turner).
Fig. 26.—*G. bombycinis*, sp. n.
Fig. 27.—*G. ? schauinslandi* (Ashmead).

In addition to these, *Ophrynopus sericatus* Mocsáry (Feb. 1900), from New South Wales, redescribed by Konow (1905, p. 186), almost certainly belongs also to this genus, and possibly either *G. queenslandensis* G. Turner (Oct. 1900) or *G. bombycinis*, sp. n., is actually synonymous with it.

Guiglia bombycinis, sp. n.

Colour.—♀. Black; red are the legs except the black bases of the coxæ and the outer side and base of the hind tibia, which are white; the middle antennal segments, the hinder parts of the mesonotum, scutellum, and middle of mesopleuræ are also touched with reddish brown.

Fore wings with 2 fuscous transverse bands separating 3 yellowish-hyaline bands; the hyaline bands occupy the extreme base and apex, while the middle band under the stigma has about the breadth of the stigma; stigma and venation in the hyaline areas yellow; in the fuscous areas, black; hind wings yellowish hyaline, slightly infuscate on apical ⅓.

Length, ♀ 9·5 to 7 mm.; fore wing 7 to 5 mm.; ♂ 7·5 to 5 mm.; fore wing 5·5 to 3·5 mm.

Head with carinated frontal area longer than broad (fig. 26) and with puncturation within the area much denser and coarser than elsewhere.

Thorax: mesonotum and scutellum matt, with very fine dense puncturation; mesopleuræ have scattered punctures, but the surface between is dull, with micro-sculpture; upper side of hind tibia has a single row of about 14 teeth (fig. 22); outer apical spur of tibia is about as long as ½ the apical breadth of the tibia.

Abdomen with segments 1–5 matt, with very close fine punctures; on 6–8 the punctures are less dense, and especially on the basal and apical margins of the segments have shining interspaces.

♂ as in ♀, except that the red colour is almost entirely replaced by black, the hind legs being without red; on the wings the basal of the two fuscous bands is entirely missing.

N. QUEENSLAND, Kuranda, 1000 ft., 14 ♀♀ (including holotype) and 11 ♂♂, 4–29. vii. 1913 (*R. E. Turner*) (British Museum).

This series was assumed by Mr. R. E. Turner to belong to the same species as the Mackay specimen described by his brother, G. Turner, as *Oryssus queenslandensis* in Oct. 1900. This again was supposed to be synonymous with *Ophrynopus sericatus* Mocsáry, Feb. 1900. Noticing certain differences in the head-sculpture, I recently remounted the Kuranda specimens, and then it became obvious that they belonged to a distinct species from the Mackay specimen.

The description of *O. sericatus* Mocsáry would apply to either, but as it was from many miles further south in New South Wales the chances are that it belongs to still another species.

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——. 1937 (*b*). Il Gen. *Oryssus* in Africa." *Id*. pp. 411 419, 1 fig., 2 plates.

——. 1937 (*c*). Un nuova *Oryssus* delle isole Filippine. *Id*. pp. 420-423, 1 fig.

——. 1937 (*d*). "Gli Orissini Africani del Gen. *Chalinus* (Hymen. Phytophaga)." *Id*. pp. 452-460, 2 plates.

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II.—*On some Anthidiine Bees* (*Apoidea*) *from Palestine.*

By G. A. MAVROMOUSTAKIS, Limassol, Cyprus.

THE Anthidiine bees recorded and described below were kindly loaned to me by Sir Guy A. K. Marshall, Director of the Imperial Institute of Entomology (except *Anthidium moreënse jerusalemicum*, subsp. n.), and the types of the new subspecies are placed in the British Museum.

Dianthidium insulare (F. Mor.) subsp. *persicolum* Mavromoustakis.

PALESTINE: Upper Galilee, Metula, 1 ♀, 2. viii. 1931.

This subspecies was described from S.W. Persia as a variety. The Palestine female agrees with the Persian typical specimen, and has the characteristic broad longitudinal yellow stripe below median ocellus reaching the supraclypeal area; the yellow stripe on second tergite is entire. Popov (Trav. Acad. Sc. U.S.S.R. Tadzhikistan, v. p. 383, 1935) records *Dianthidium insulare* from Tadzhikistan, and I have obtained specimens of *Dianthidium insulare persicolum* from HISSAR MOUNTAINS: Kvak, 8000 ft. (*V. Gussakovskij*).

Anthidium ferrugineum F., var.

PALESTINE: Kinereth, 1 ♂, 11. vi. 1931.

The above male has the colour changed by cyanide, but the wings are clearer than in the typical *ferrugineum* from Spain, and it stands near to the var. *subzonatum* Alfken.

Anthidiellum strigatum judaicum (Alfken).

PALESTINE: Upper Galilee, Kfar Giladi, 1 ♂, 6. ix. 1931.

Agrees with the subspecies *judaicum* Alfken; the abdominal tergites 3 to 7 are entirely pale yellow, with a subapical transverse linear black stripe on tergites 3 to 5; vertex with entire yellow stripe.

Anthidium cribratum F. Mor. subsp. *palestinicum*, nov.

Female.—Length a little more than 7 mm.

Differs from *Anthidium cribratum* F. Mor., from Turkestan, as follows:—Punctation of mesonotum and scutellum denser; occipital yellow lateral stripe broadly descending and covering the upper half of cheeks; first and second tergites with broad and long lateral yellow stripes, that on second nearly reaching the middle; third tergite with broad basal yellow stripe interrupted in middle; fourth and fifth tergites with the base and a linear subapical stripe narrowly black, rest yellow and slightly interrupted in middle; sixth tergite yellow interrupted in middle, base narrowly black at sides; scopa white.

Male.—Length 7·5 mm.

Similar to the female; sixth and seventh tergites entirely pale yellow; seventh tergite entire.

PALESTINE: Migdab, 1 ♀ (type), 19. v. 1931; Tiberias, 1 ♂ (allotype), 3. vii. 1931.

I have compared the Palestine subspecies with specimens of *Anthidium cribratum* F. Mor., from Turkestan, and the former has the punctation on thorax denser above and the yellow sufficiently rich. *Anthidium lituratum* Latr. has the punctation much finer, and the colour of the body and the form of seventh tergite of the male different.

Anthidium variegatum subsp. *incisum* Friese.

Palestine: Upper Galilee, Kfar-Giladi, 3 ♀♀, 19. viii. 1931, 1 ♀, 1 ♂, 6. ix. 1931.

The above small series is variable; one of the females has the clypeus yellow; tergites 1 to 3 with broad basal lateral long yellow stripes not reaching the middle, that on second and third anteriorly slightly notched in middle; fourth and fifth tergites with broad and long basal yellow stripes reaching middle; sixth tergite yellow interrupted longitudinally in middle, base laterally and the apical margin narrowly black, in the other females the lateral stripes on tergites 2 to 4 notched in middle above; clypeus has a narrow median longitudinal black stripe or a subapical narrow black longitudinal mark nearly reaching the middle; in the male tergites 4 to 7 are mostly yellow, the yellow on fourth notched in middle above, apical margin of fourth and fifth and the middle apical spine black.

Anthidium moricense Friese subsp. *jerusalemicum*, nov.

Male.—Length 9·5 mm.

Lateral face-marks reaching top of eyes, a broad longitudinal mark below median ocellus, occipital entire stripe broadly descending on cheeks and reaching base of mandibles yellow. Mesonotum with broad L-shaped yellow stripe at sides, lower branch reaching axillæ; sides of mesopleuræ broadly marked with yellow in front above; scutellum from base to middle black, rest and the axillæ entirely yellow; thorax with somewhat dense and short golden hairs above; tubercles yellow. Tergites 1 to 3 with transverse very broad entire yellow stripe (nearly covering sides on first and second), the stripe on first attenuated in the middle, and that on second and third notched in middle above; fourth and fifth tergites mostly yellow, slightly notched in the middle above, apical margins narrowly black; sixth tergite yellow, apical margin very narrowly black-brown in middle;

seventh tergite as in *Anthidium caturigense* Gir., the median quadrangle and the blunt apex of the median spine-like projection black-brown.

PALESTINE: Jerusalem, 1 ♂ (type), 13 v. 1922 (*P. A. Buxton*).

This subspecies has the yellow very rich, and the pilosity on vertex, occiput, front, and thorax above golden. *Anthidium moreense* Friese was described from South Greece, and is closely related to *Anthidium caturigense* Gir.

III.- *Some* Laccophyllidæ *from the Middle Devonian of Bohemia.* By FERDINAND PRANTL, R.N. Dr., Department of Geology, National Museum, Prague.

[Plates I.-III.]

INTRODUCTION.

So far, very little attention has been paid to the coral fauna of the Devonian of Bohemia, especially to the simple corals from zones younger than the Koněprusy Limestone. As a matter of fact, they are surprisingly little known. No one has devoted himself to the study of these fossils since Počta, now more than thirty years ago. Only eleven species from the Middle Devonian were known to Počta, but this number has been considerably increased during the last few years by systematic collecting, especially from the so-called "White Beds," in zones *gα* and *gγ*. Thus there is a considerable need for a systematic description of the Devonian Tetraseptata from the Barrandian and a comparison of these with the corals of foreign regions where they have been extensively studied.

The present paper deals with the family Laccophyllidæ. It is true that this family is only represented by three genera in the Devonian of Bohemia, but, on account of the numerous species and the great number of the individuals, it is one of the most important families of the phylum.

The author tenders his thanks to Dr. Stanley Smith for kindly revising the manuscript and for lending him important forms for comparison. He also thanks Prof. O. H. Schindewolf for the loan of specimens from the

collections of the Geol. Landesanstalt in Berlin and Prof. J. Perner and Mr. R. Růžička for placing at his disposition the corals recently collected at Holyně from $g\gamma$.

Finally, he has also much pleasure in acknowledging his indebtedness to Dr. J. Koliha, the Director of the Museum, Prague, for advice and helpful discussion.

NOTE ON THE PRESERVATION.

The majority of the forms described below come from so-called "White Beds." These are much weathered layers of the limestone, from which a well-preserved fauna can be obtained by "washing." The corals are, as a rule, extremely well preserved so far as their outer appearance is concerned, even down to the most minute details, but their internal structure is generally in a very poor state of preservation. The specimens are, as a rule, so much weathered that thin sections can only be prepared with great difficulty, or if, as sometimes occurs, they are irregularly silicified, their internal structure is entirely destroyed. Specimens from hard limestones or from shales, on the other hand, while their external characters are less well displayed, have well-preserved internal structures and can be studied by means of thin sections.

STRATIGRAPHICAL TABLE OF THE DEVONIAN OF BOHEMIA.

A table explaining the stratigraphical position of the beds mentioned in this paper is given below :—

Middle Devonian.	h.	Srbsko Beds.		
	$g\gamma$.	Hlubočepy Limestones.		
	$g\beta$.	Daleje Shales.		
	$g\alpha$.	Bránik Limestones.	$g\alpha_3$.	Zlichov Limestones.
			$g\alpha_2$.	Prokop Limestones.
			$g\alpha_1$.	Dvorce Limestones.
Lower Devonian.	f.	Koněprusy Limestones.	Kosoř Limestones.	
Upper Silurian which is conformable with the Devonian.				

The Devonian of Bohemia is predominantly calcareous, composed for the most part of limestone; only the Daleje Shales and the Srbsko Beds are argillaceous. The former consists mainly of dark clay-shales, with subsidiary beds of nodular marly limestone, while the latter, the youngest strata of the Barrandian, are without limestones, and are composed entirely of shales, sandstones, and quartzites.

Family **Laccophyllidæ** Grabau, 1928.

Diagnosis (according to Grabau, 1928, p. 82).—"Simple corals with the septa pinnate and in quadripartite position in the young or primitive forms, but quickly uniting at their inner ends to form a true inner wall or phyllotheca which encloses a cylindrical or slightly enlarging tube generally divided by horizontal tabulæ. This wall may contract to leave some septa free. Dissepiments as a rule sparingly developed."

Remarks.—Grabau places the following genera in the family Laccophyllidæ: *Permia* Stuckenberg 1895, *Laccophyllum* Simpson 1900, *Alleynia* Počta 1902, and *Barrandeophyllum* Počta 1902. But to these must also be added the genera *Metriophyllum* Edwards & Haime 1854, *Ptychocyathus* Ludwig 1866, and *Syringaxon* Lindström 1882.

The genera *Alleynia* and *Ptychocyathus* are congeneric, however, and are synonymous with the genus *Syringaxon* *.

Grabau, 1928, p. 96, also places the genus *Retiophyllum* Počta, 1902, in the Laccophyllidæ, but this is an aberrant form which grows on one side. According to a communication from Dr. Stanley Smith, the validity of this genus and its systematic position is highly uncertain The genotype (by monotypy) *R. mirum* Počta, 1902, is represented only by two badly preserved syntypes, and no other specimens are known to the author. Since this material is inadequate for the re-description, and no definite conclusions can be reached concerning the form, the species is not considered here.

The Laccophyllidæ range from the Silurian to the Permian.

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* Accepted on the authority of Butler, 1935, p. 117, as Lindström's original work ("Anteckningar om Silurlagren på Carlsöarne," Öfvers. Kongl. Vetensk. Akad. Förhandl. xxxix. 1882, no. 2, pp. 5–30) was not accessible.

Genus SYRINGAXON Lindström.

1866. *Ptychocyathus* Ludwig, pp. 134, 187, 194.
1882. *Syringaxon* Lindström, p. 20.
1902. *Nicholsonia* Počta, p. 184.
1902. *Alleynia* Počta, p. [vi].
1928. *Alleynia* Grabau, p. 84.
1935. *Syringaxon* Butler, p. 117.

Genotype (by monotypy).—*Cyathaxonia siluriensis* M'Coy, 1851, p. 36, pl. 1 *c*, figs. 11, 11 *a*.

Diagnosis (given by Butler, 1935, p. 117).—"Small, simple, conical, or cylindrical Rugose corals in which the axial ends of the major septa are dilated and laterally contiguous, forming an inner wall or aulos. The tabulæ, which are few in number and irregularly spaced, are divided by the aulos into an inner and outer series; the inner tabulæ are flat or slightly depressed; the outer tabulæ vary in form, but generally slope upwards from the epitheca to the aulos. Dissepiments are absent. Stereome is usually abundant and cements the axial ends of the minor septa to the sides of the major septa."

Remarks and Relationships.—Počta, 1902, pp. 184–189, described under the generic name *Nicholsonia* five species of *Syringaxon* from Bohemia, namely, *N. bohemica* (Barrande), *N. curta*, sp. n., *N. major*, sp. n., *N. nana*, sp. n., and *N. perfecta*, sp. n.—all of these except the first, which is a Devonian form, are from the Silurian. Finding the name *Nicholsonia* pre-occupied * he substituted, in the "Addenda et Corrigenda" of the same work, that of *Alleynia*. By this name the genus is usually known.

Serious doubt has been expressed within recent years concerning the status of *Alleynia*. Grabau, 1928, p. 86, remarked that, so far as the general characters are concerned, there seems little reason to doubt that *Nicholsonia* (or *Alleynia*, as it is more properly called) and *Laccophyllum* [established by Simpson upon a Silurian form (Niagaran) from North America] are congeneric, in which case the latter name has priority. Schindewolf, 1931, p. 631, pointed out that *Alleynia* is apparently synonymous with *Ptychocyathus* Ludwig. Gorsky, 1932, p. 87, also considered that the genus *Laccophyllum* was identical with *Nicholsonia* (*Alleynia*) and *Barrandeophyllum*, described by Počta from the Devonian of Bohemia, and he records a species from the Upper Devonian or from the transitional Devono-Carboniferous deposits of the Russian Steppe. Finally, Butler, 1935, p. 118, expressed the opinion that "... it appears from the figures given by Počta and Simpson that the type-species of *Laccophyllum* and *Alleynia* may be congeneric with *Cyathaxonia siluriensis* M'Coy." From actual observation the author is able to affirm that the septal development of *Alleynia bohemica* (Barrande, 1865) and of *Ptychocyathus excelsus* Ludwig, 1886, is in perfect agreement with that in *Syringaxon siluriensis* M'Coy, 1851, as described by Butler, 1935, p. 118, and he therefore considers *Alleynia* and *Ptychocyathus* to be congeneric with *Syringaxon*. In all three the minor septa appear cyclically, and are not inserted alternately with the major septa from the beginning as in *Petræa* (see Butler, 1935, p. 120; Hill, 1935, p. 505; Lang in Schindewolf, 1931, p. 649, etc.). According to the rules of priority, all the three forms should be called *Ptychocyathus* Ludwig in agreement with Schindewolf's (1931, p. 631) conception. But the author accepts the generic name *Syringaxon* Lindström, 1882, for the Bohemian species, since Lang and Smith, 1934, p. 79, advocate the suppression of Ludwig's generic names, which were never in general use.

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* By Schlüter, 1885, p. 53, for a Rugose coral; by Waagen and Wentzel, 1886, p. 874, for a polyzoan; by Davis, 1887, explanation of pl. li., for a polyzoan; by Bogatirew, 1899, pp. 35, 68, for a polyzoan; and by Kiär, 1899, p. 37, *for a genus of the* Heliolithidæ.

Počta, 1902, p. 181, placed his genus *Alleynia* in the family Lindstrœmiidæ, and regarded the aulos as a homologous formation like the stereocolumella. He therefore believed that there was a close relationship between *Alleynia* Počta, 1902, and *Lindstrœmia* Nicholson & Thompson, 1876. According to Hill, 1935, p. 514, the aulos "is an axial tube, which separates the tabulæ of the axial and periaxial area," and therefore it cannot be identified with the stereocolumella.

On the other hand, Počta, 1902, p. 185, pointed out the great resemblance between his genus *Alleynia* and *Metriophyllum* Edwards & Haime, 1850, p. lxix. This observation of his is quite justified, and has been recently confirmed by Dr. Stanley Smith. According to a written communication from him, ".... the genotype of this genus (*M. bouchardi*) is very closely related to *Syrin-*

gaxon"[*]. The relation between the genera *Metriophyllum* and *Syringaxon* was evidently known to Lindström (1869, p. 420), as he formally placed the genotype of his genus *Syringaxon* (*Cyathaxonia siluriensis* M'Coy) in the genus *Metriophyllum*.

As regards the genus *Laccophyllum* Grabau, Gorsky and Butler seem justified in considering *Alleynia*, *Laccophyllum*, and *Syringaxon* synonymous. Unfortunately, the author has not seen specimens of the type-species of *Laccophyllum* and *Metriophyllum*, and this problem cannot be solved until the plan of the septal development in all these has been determined. Therefore, he does not propose at present to merge them with *Syringaxon*. But if it be proved later that the genotypes of *Metriophyllum* and *Syringaxon* are congeneric, all the forms discussed above must, according to the rule of priority, be placed in the genus *Metriophyllum*.

Occurrence.—*Syringaxon* has a range from Upper Silurian to Lower Carboniferous.

The genus is represented in the Barrandian by a great number of species, and has been found in all zones of the Upper Silurian and Devonian, with the exception of the Koněprusy Limestones, *f*. Počta's statement, 1902, explanation of plate 112, concerning the occurrence of this genus in the Srbsko Beds, *h*, has not been confirmed by recent discoveries.

So far as can be judged from the material found in the Barrandian, many species of *Syringaxon* have a relatively narrow vertical stratigraphical distribution. It is, therefore, possible that they can be used advantageously as zonal fossils.

Syringaxon bohemica bohemica (Barrande).
(Pl. I. fig. 1; Pl. III. figs. 1–4.)

1865. *Petraia bohemica* Barrande, pp. 51, 303[†].
1868. *Petraia bohemica* Barrande, Bigsby, p. 200.
1902. *Alleynia bohemica* Barr. sp., Počta, p. 186, pl. 68, figs. 38–51, 53–56; pl. 112, figs. 10–11; text-figs. 5–6. Non pl. 68, fig. 52, which is *S. curta*.

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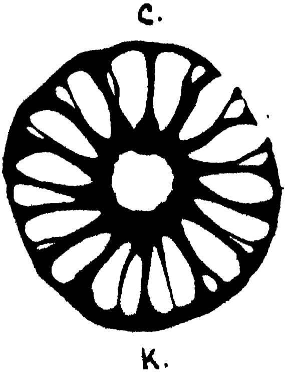
[*] *Metriophyllum bouchardi* agrees with *Syringaxon* in its mode of septal insertion and in having long "counter" minor septa, but it differs from *S. siluriensis* in the septa meeting axially and forming a very solid axial structure. Moreover, *Metriophyllum bouchardi* has strongly developed carinæ of a peculiar type.—S. S.

[†] In his manuscript on the gastropoda, Barrande described a few specimens of this species as *Capulus myrmido* Barr. MSS.; two of

Holotype (here designated).—Specimen figured by Počta, 1902, pl. 68, fig. 43, Daleje Shales, *gβ*. Hlubočepy. Barrandeum, National Museum, Praha, Specimen CF1325. The holotype is a small specimen, proximally and distally complete, but in which the calice is embedded in the matrix. Length 9 mm., maximum diameter 5·5 mm.

Description.—The corallum is small, trochoid, sometimes curved. The largest specimen examined was 21 mm. in length and 12 mm. in maximum diameter. The calice is very deep, crateriform, and has steep sides. The epitheca is thick and smooth, both longitudinal and transverse striations being very faint.

Text-fig. 1.



Syringaxon bohemica bohemica (Barr.). Sketch from thin section of a specimen from the Daleje Shales, *gβ*, Hlubočepy. C, cardinal; K, counter. (Adult stage.)

Internal Structure.—Major septa, which in the adult stage are radially arranged and about 17 in number, are very thick. Minor septa are sometimes absent, and when present are short and abut against major septa, with the exception of the two minor septa, which flank the counter-septum. These are, in the adult stage of the coral, as long as, or only slightly shorter than, the

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which were figured under the name *Pollicina myrmido* without any description (Barrande, 1903, Syst. Silur. du Centre de la Bohème, pt. I, Recherches Paléontologiques, vol. iv., Gastropodes, tome i. pl. v, figs. 1-3). But Perner (1911—ibid. vol. iv. tome iii. p. 187) showed that they were conspecific with *Petraia bohemica* Barr., and deleted the name *Pollicina myrmido* Barr. sp. from the list of Bohemian Paleozoic gastropoda.

major septa, but appreciably thinner. This acceleration of the growth of the two counter lateral minor septa is of help in the orientation of the transverse sections. A narrow but distinct peripheral stereozone may be developed. The aulos is perfectly formed and circular in transverse sections. The wall of the aulos is thickened. Tabulæ inside the aulos, which are indifferently complete or incomplete, flat or slightly concave, sometimes widely spaced sometimes closely packed, are 5–8 in a length of 5 mm. The tabulæ outside the aulos are similar to those inside, but are inclined towards the periphery.

Septal Development.—The development of the septa was followed out by rubbing down the proximal end of the specimens. In the brephic stage the protosepta meet at the axis. In the early neanic stage the insertion of the meta-major septa takes place, normally on either side of the cardinal septum and at the couter-side of each alar septum. At a later neanic stage the formation of the aulos takes place. The pinnate arrangement of the septa of the major cycle is quite clear at this stage. The distribution of metasepta is usually regular- -they are in threes in each quadrant (excluding the two counter-lateral septa). The two long minor septa flanking the counter-septum —" the counter-lateral minor septa "— are formed first, the other minor septa appear later, more or less simultaneously. In the later neanic and in the ephebic (adult) stages, septa are arranged radially.

Remarks.-- The two strikingly long minor septa which flank the counter-septum were observed also by Butler (1935, p. 119) in *S. siluriensis*, and can be readily recognized in most Bohemian species of the genus.

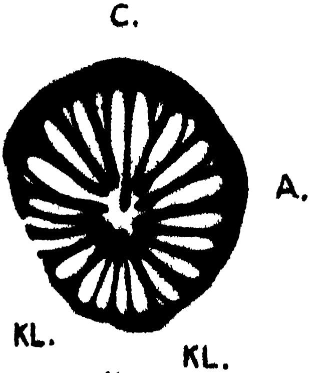
The amount of stereoplasm present in the various specimens differs somewhat, even in specimens from the same strata and from the same locality. The greatest difference in this respect is to be found in specimens from shale and those from limestones. The latter have always much less stereoplasm than the former. In some of the specimens from the limestone the axial ends of the major septa are, in the adult stage, insufficiently dilated to be contiguous and are joined only by stereoplasm.

As Počta (1902, p. 190) has pointed out, *S. bohemica bohemica* is very similar to *S. perfecta* from the Upper Silurian. Both species agree in their general characters and in the number (17) of the major septa, but they differ in the length of the minor septa and in the form and arrangement of the tabulæ inside the aulos. Moreover, the septal arrangement in the Silurian species is pinnate, even in the ephebic stage.

Among the Devonian species of *Syringaxon* the closest ally of *S. bohemica bohemica* is *S. bohemica barrandei*, which may very well be a direct descendant of the former. *S. bohemica barrandei* differs from *S. bohemica bohemica* in having much longer minor septa and a greater number of tabulæ inside the aulos (10–11, instead of 5–8).

Horizon and Locality.—Zlíchov Limestones, $g\alpha_3$, Hlubočepy, Černa rokle; Hlubočepy, Kettner's Coral Reef by the Little Chapel, in the first quarry after the last houses in Hlubočepy, on the road to Malá Chuchle. Daleje-Beds, $g\beta$, Daleje, Hlubočepy, Křenkovice, and Vávrovice. ? Srbsko-Beds, *h* [according to Počta's statement (explanation of pl. 112), but the occurrence of the species has not been confirmed by recent discoveries].

Text-fig. 1 *a*.



Syringaxon bohemica barrandei, sp. n. Sketch from thin section in the distal part of a specimen from the Hlubočepy Limestones, $g\gamma$, Hlubočepy. C, cardinal; K, counter; A, alar; KL, counter-lateral. (Gerontic stage.)

Syringaxon bohemica barrandei, sp. n. (Pl. I. figs. 2 & 3; (Pl. III. fig. 5; text-fig. 1 *a*.)

Holotype (here designated).—The specimen figured in Pl. I. figs. 2, 7. Hlubočepy Limestones, $g\gamma$, Holyně. Barrandeum, National Museum, Praha. The holotype is a small specimen, proximally complete and with imperfect calicular wall. Septa visible in the calicular platform. Length 19 mm., maximum diameter 10 mm.

Description.—The corallum is small, trochoid, and sometimes curved. The calice is very deep, and has steep sides. The epitheca is thin and smooth, annular striations being very faint. Rejuvenescence is unknown.

Internal Structure.—The major septa, which in the ephebic stage are radially arranged and about 17 in number, are thin. The minor septa may be free or may be inclined towards and cemented by stereoplasm to the major septa on their counter-side. The minor septa vary in length, but typically they are about half the length of the major. The peripheral stereozone is narrow. The aulos is perfectly formed, circular in transverse sections, but has a thin wall. The tabulæ inside the aulos are complete, transverse, numerous, and closely packed, 10-11 in a space of 5 mm. Those outside the aulos are similar, but are more numerous and are deeply inclined towards the periphery.

Note on the Septal Development.—The aulos is usually, but not always, seen in the floor of the calice in the late ephebic stages of the coral. Where the aulos is present the septa are radially arranged, when absent they show a pinnate symmetry ; the ends of the protosepta (which, particularly the cardinal septum, are longer than the metaseptal) are free, but the metasepta unite usually in pairs to form a horse-shoe tube. The counter-septum is flanked by two "counter-lateral" minor septa very much longer than the other members of the cycle. This, the author considers, indicates a senile or gerontic stage, since he has only noticed it in the largest specimens.

The same feature has also been observed in *S. perfecta* by Počta (1902, p. 189, text-fig. 8) and by Heritsch (1929, p. 100, text-figs. 18–19, and pl. viii. fig. 902), who illustrated specimens of the coral from the Alpine Upper Silurian. Grabau (1928, p. 86) regarded this feature as exceptional, and supposed that " the present species represents an exceedingly accelerated form in which the latter stages again return to the primitive condition. Such return must then be regarded in the light of degeneration." On the other hand, however, he regarded it as so important that he even inserted it in his diagnosis of the whole family Laccophyllidæ. But this feature seems to be an individual one, though very common. It has been noticed by the author in a number of specimens of this and of other species of *Syringaxon* and *Barrandeophyllum*.

Relations.—The author considers *S. bohemica barrandei* to be a direct descendant of *S. bohemica bohemica*, from which it differs only in its relatively greater size, much longer minor septa, and more numerous complete tabulæ inside the aulos.

Horizon and Locality.—Hlubočepy Limestones, *gy*, Hlubočepy, old quarry near the railway viaduct. Holyně, in the "White Beds" of the highest strata.

Syringaxon carens, sp. n. (Pl. I. figs. 4 & 5; Pl. III. figs. 6 & 7.)

Holotype (here designated).—The specimen figured on Pl. I. figs. 4 & 5. Zlíchov Limestones, *gy*. Hlubočepy, "Kettner's Coral Reef." Barrandeum National Museum, Praha.

The holotype is a tall specimen, proximally and distally incomplete, with the septa visible on the fractured surfaces. Length 32 mm., maximum diameter 10·5 mm.

Description.—The corallum is cylindrical, tall, and erect, with occasional radiciform processes. Annular rugosity is only very feeble, but interseptal fluting is fairly strong. Calice moderately deep, with steep sides. Rejuvenescence observed in one case only.

Internal Structure.—The major septa, which, in the ephebic stage, are radially arranged and rather thin, are about 28 in number. The minor septa are of medium length, with their axial ends inclined towards and abutting against major septa. The two counter-lateral minor septa flanking the counter-septum are as long as the major septa, but much thinner, and play the part of major septa in the radial symmetry. The small aulos is perfectly formed and circular in section. The tabulæ inside the aulos are complete, very irregularly spaced, 3–9 in a space of 5 mm. The tabulæ outside the aulos are complete, widely spaced, and inclined peripherally.

Relations.—This species differs from all other members of the genus in the number of major septa as well as in its general form.

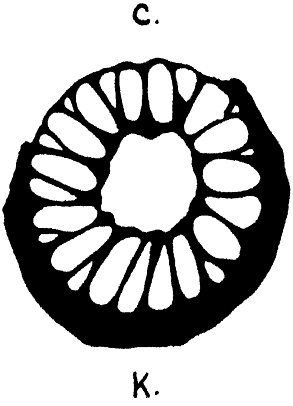
Horizon and Locality.—Zlíchov Limestones, $g\alpha_3$, Hlubočepy, "Kettner's Coral Reef" by the Little Chapel, in the first quarry after the last houses of Hlubočepy, on the road to Malá Chuchle.

Syringaxon smithi, sp. n. (Pl. I. figs. 9–12; Pl. III. figs. 8 & 9; text-fig. 2.)

Holotype (here designated).—The specimen figured in Pl. I. figs. 9, 10. Zlíchov Limestone, $g\alpha_3$, Hlubočepy, Kettner's Coral Reef. Barrandeum, National Museum, Praha.

The holotype is a small specimen, proximally and distally complete. Major septa are visible in the calicular platform, but the minor septa are to a great extent broken off. Length 13 mm., maximum diameter 6 mm.

Text-fig. 2.



Syringaxon smithi, sp. n. Sketch from thin section of a specimen from Zlíchov Limestones, $g\alpha_3$, Hlubočepy. C, cardinal; K, counter. (Neanic stage.)

Description.—Corallum short, cylindrical, sometimes with talon at the proximal end, or with occasional radiciform processes. Annular rugosity is very strong, but septal ridges are very faint. The calice is crateriform, with steep sides, but shallow in proportion to the length of the corallum. The largest specimen examined was 19 mm. in length and 11 mm. in maximum diameter. Rejuvenescence was observed in a few cases.

Internal Structure.—The major septa, about 20 in number, are only slightly thickened. The minor septa are sometimes absent, and when present vary in length and abut against the major septa. The peripheral ends of the septa taper, and are embedded in the narrow, but very distinct, stereozone. The two counter-lateral minor septa are as long as the major septa and play their part in radial symmetry. The aulos is circular in section and perfectly formed. Tabulæ inside the aulos, which may be complete or incomplete, transverse or slightly depressed, are very numerous (16–18 in 5 mm.). The tabulæ outside the aulos are also crowded and not always complete. They are slightly inclined towards the periphery and are sometimes curved.

A gerontic stage was occasionally observed as in *S. perfecta* and *S. bohemica barrandei*. In this, the major septa arranged themselves in quadrants.

Remarks.—This species differs from all other members of the genus in its numerous crowded tabulæ, the large number of its major septa, and its general form.

Horizon and Locality.—Zlíchov Limestone, $g\alpha_3$, Hlubočepy, Kettner's Coral Reef.

Syringaxon memorabilis, sp. n. (Pl. I. figs. 7 & 8; Pl. III. figs. 11 & 12.)

Holotype (here designated).—Pl. I. figs. 7 & 8, Hlubočepy Limestone, $g\gamma$, Holyně. Barrandeum, National Museum, Prague.

The holotype is a very small specimen, proximally complete, with incomplete calicular wall. Septa are visible in the calicular platform. Length 6 mm., and the maximum diameter 4·5 mm.

Description.—The corallum is very small, tall, erect, cylindrical, and has usually a talon. The largest specimen examined is 8 mm. in length and 4·5 mm. in maximum diameter. The calice is very deep, with steep sides. The epitheca is smooth, both annular and vertical striations being very faint. Rejuvenscence is unknown.

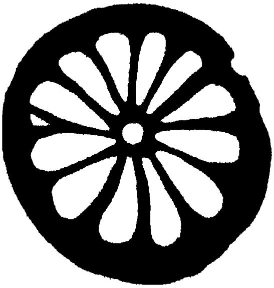
Internal Structure.—The major septa, about 10 in number, are thick, short, and radially arranged. There are no minor septa. The aulos is wide, but varies in diameter, and is completely formed and perfectly circular in section. Tabulæ inside the aulos are complete, transverse, and numerous, 14–15 in 5 mm. Tabulæ outside same as inside, but are not so numerous, and horizontal or only slightly inclined peripherally.

Remarks.—Butler (1935, p. 123) has shown that the aulos in *S. siluriensis* is formed by the axial ends of the major septa, which are dilated and laterally contiguous, but are directed towards the axis of the corallum. This formation of the aulos corresponds to Grabau's idea (1922, p. 20) of a "*stereotheca.*" In *S. memorabilis*, however, and also in *S. depressa* the aulos is formed by some slight thickening and by the bending of the axial ends of the major septa, so that it thus corresponds to Grabau's (1922, p. 19) true "*phyllotheca.*"

This species is easily distinguishable from the other Bohemian species by its size, form, and the number of septa and tabulæ.

Horizon and Locality.—Hluvočepy Limestone, *gγ*, Holyně, White Beds in the highest portions of the strata.

Text-fig. 3.



Syringaxon inopinata, sp. n. Sketch from thin section of a specimen from the Dvorce Limestones, $g\alpha_1$, Hlubočepy. (Adult stage.)

Syringaxon inopinata, sp. n.
(Pl. I. fig. 6; text-fig. 3.)

Holotype (here designated).—The specimen shown in Pl. I. fig. 6, Dvorce Limestones, $g\alpha_1$, Konvářka, near Hlubočepy. Barrandeum, National Museum, Prague.

The holotype is a small specimen, proximally and distally incomplete. The septa are visible in the fractured surfaces. Length 7 mm., maximum diameter 3·5 mm.

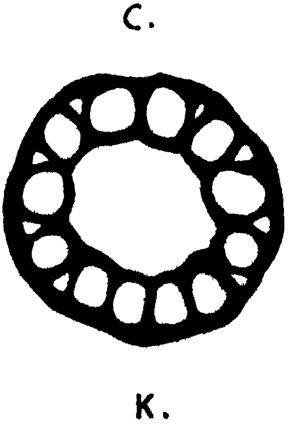
Description.—The corallum is small, cylindrical, tall, and erect. The calice is deep (?), with steep sides. Thick epitheca bears strong interseptal flutings, and occasional slight annular rugosities. Rejuvenescence is unknown.

Internal Structure.—The major septa, about 12, are very thick, and are radially arranged. Their peripheral ends are tapered and embedded in the narrow, but distinct, peripheral stereozone. Minor septa are absent (?). The aulos is small, perfect, and circular in section. Tabulæ inside the aulos are complete, transverse, and widely spaced. Tabulæ outside the aulos are the same as inside, but are inclined peripherally.

Remarks.—In the number of septa (12) this species agrees with *S. alleynioides*. It differs, however, in its cylindrical form and characteristic peripheral stereozone.

Horizon and Locality.—Dvorce Limestone, $g\alpha_1$, "White Beds" in the lower parts of the strata, Konvárka, near Hlubočepy and Hostím, quarry by the mouth of the Kačák Creek entering the Berounka River.

Text-fig. 4.



Syringaxon alleynioides, sp. n. Sketch from thin section of a specimen from the Hlubočepy Limestones, $g\gamma$, Holyně. C, cardinal; K, counter. (Ephebic stage.)

Syringaxon alleynioides, sp. n.
(Pl. II. fig. 1; text-fig. 4.)

Holotype (here designated).—The specimen shown as fig. 1 in Pl. II. Hlubočepy Limestones, $g\gamma$, Holyně. Barrandeum, National Museum, Praha. The holotype is a small specimen, proximally complete, with incomplete calicular wall. Septa are visible in the calicular platform. Length 4 mm., maximum diameter 3 mm.

Description.—The corallum is very small, widely trochoid, sometimes curved. The largest paratype is 6 mm. in length and 5 mm. in maximum diameter. The epitheca is smooth, both annular and vertical striations being very faint. The calice is very deep, with steep sides. Rejuvenescence is unknown.

Internal Structure.—Major septa, about 12 in number, are thick, radially arranged. Minor septa absent, or very short and abutting against the major septa. The aulos is completely formed, but varies in diameter, and is circular in section. Tabulæ inside aulos complete, transverse, and widely spaced; tabulæ outside aulos same as inside, but inclined towards periphery.

Remarks.—In the number of septa (12) *S. alleynioides* agrees with *S. inopinata*, but differs in its trochoid form and in the absence of the peripheral stereozone.

Horizon and Locality.—Hlubočepy Limestone, *gγ*, Holyně, "White Beds," in the highest portions of the strata.

Syringaxon depressa, sp. n.

(Pl. II. figs. 2 & 3.)

Holotype (here designated).—The specimen shown in Pl. II. figs. 2 & 3. Hlubočepy Limestone, *gγ*, Holyně. Barrandeum National Museum, Praha. The holotype is a small specimen, proximally complete, with very imperfect calyx. The septa are visible in the calicular platform. Length 4·5 mm., maximum diameter 4·5 mm.

Description.—The corallum is small, widely trochoid, curved, and has usually a large talon. Epitheca smooth, or with fine annular striations. The calice, which is not very deep, is crateriform, and has steep sides. Rejuvenescence is unknown.

Internal Structure.—The major septa (about 14) are short and thick. The short minor septa usually abut against the major. The aulos is circular in section, complete, very wide. Tabulæ inside the aulos are complete, transverse, and widely spaced. Tabulæ outside the aulos are the same as inside, but inclined perpherally.

Remarks.—This species approaches *S. alleynioides* in the trochoid form of the coral and in the arrangement of the minor septa, and *S. memorabilis* in the wide aulos and in a talon usually being present. But it differs from both in its greater number of major septa and fewer tabulæ.

Horizon and Locality.—Hlubočepy Limestone, *gγ*, Holyně "White Beds" in the highest portions of the strata.

BARRANDEOPHYLLUM Počta, 1902, emend. autor.

1902. *Barrandeophyllum* Počta, p. 190.
1928. *Barrandeophyllum* Počta, Grabau, p. 87.

Genotype (by monotypy).—*Barrandeophyllum perplexum* Počta, 1902. Bránik Limestones, *gα*, Hlubočepy.

Diagnosis.—Genus of the Laccophyllidæ allied to and derived from *Syringaxon*. In habit, form, and general structure it is identical with the parent genus, but it is easily distinguished from *Syringaxon* by the irregularities of the aulos, which is usually elliptical in sections, and by a sparing development of dissepiments. Stereoplasm is always present, but is not abundant.

Remarks.—Počta (1902, p. 190) cited as the chief distinguishing feature of the genus *Barrandeophyllum* its complete absence of stereoplasm as compared with *Alleynia*. But as Grabau (1928, p. 88) has rightly pointed out "it might be questioned whether this feature is sufficient to be of generic value." Instead, Grabau indicated as an important feature the fact that the aulos of this genus widens rapidly, while that of *Alleynia* from the same horizon is more usually cylindrical (*ibid.* p. 88). Stereoplasm is, however, always present in the genotype (*B. perplexum*), and cements the axial ends of some minor septa to the adjacent major septa on their counter-side. It also forms a very narrow but distinct peripheral stereozone. Grabau (1928, p. 88) considered "*Alleynia*" i. e., *Syringaxon*) and *Barrandeophyllum* to represent two diverging types, and stated that "it is quite possible . . . that *Barrandeophyllum* is a derivative of the Silurian *Alleynia*." This view seems to be correct, and the descendants of *Barrandeophyllum* should be searched for in the compass of *S. major*-group, which has similarly an aulos irregularly elliptical in section and comparatively little stereoplasm.

Occurrence.—Middle Devonian—Lower Carboniferous.

Barrandeophyllum perplexum Počta.
(Pl. II. fig. 5; Pl. III. figs. 13–16.)

1902. *Barrandeophyllum perplexum* Počta, p. 192, pl. 108, figs. 4, 5, 7, 10, 13, 19; text-figs. 9 & 10.

1934. *Barrandeophyllum perplexum* Počta, Le Maitre, p. 34, pl. vi. fig. 10.

Lectotype (here chosen).—The specimen selected from Počta's *cotypes*, figured here as fig. 5 in Pl. II.

The lectotype has a broken proximal end and the calice is filled by matrix. The septa are visible on the fractured proximal surface. Length 18 mm., maximum diameter 17 mm.

Description.—The corallum is of medium size, trochoid, sometimes curved. The calice is deep with steep sides. The epitheca is thin, with well-marked septal grooves, showing very clearly the positions of the cardinal and alar fossulæ. Transverse rugosity usually feeble. Rejuvenescence or increase is unknown.

Internal Structure.—The major septa, about 26 in number, are long and thin, and in the adult stage are radially and more or less irregularly arranged. Their tapering peripheral ends are embedded in a very narrow, but distinctly peripheral stereozone. The minor septa vary in length, but are typically about half the length of the major septa. Their axial ends are free, or are inclined towards and cemented to the major septa on their counter-side by stereoplasm. The wide aulos is completely but irregularly formed, and is elliptical in section. Tabulæ inside the aulos may be complete or incomplete; slightly concave, irregularly spaced, and few in number; 3–6 tabulæ in 5 mm. Those outside the aulos are similar to the ones inside, but are inclined to the periphery. The dissepiments are small and vary in number.

Septal Development.—Since all the specimens are incomplete proximally and the earliest stage present is neanic, it has not been possible to study the brephic stage. In an early neanic stage the septa meet at the axis; later, when the aulos begins to take form, the pinnate disposition of the septa is clearly seen. This primitive tetrameral arrangement, already pre-supposed by Grabau (1928, p. 88), allows one to easily distinguish the cardinal, two alar, and the counter-septa. The counter-septum is flanked on each side by a very long counter-lateral minor septum, which show acceleration in growth like those in *Syringaxon*, and play later, in the ephebic stages, the part of the major septa in the radial symmetry.

The protosepta, especially the cardinal septum, are usually slightly longer than the metasepta. Grabau's contention (1928, p. 88) that the cardinal septum has become aborted in the young stages is thus incorrect. The number of the septa in each quadrant is usually the same, if the two counter-lateral septa are excluded.

Note on the Aulos.—The structure of the aulos in *B. perplexum* is interesting, since it associates the characters of the "*stereotheca*" and the "*phyllotheca*" of Grabau (1922, pp. 18–21). The axial ends of the major septa, which are always more or less dilated, are either directly and closely attached to each other, or are slightly separated and nearly straight, just as in true "*phyllotheca*," thus supporting Butler's contention (1935, p. 123) that there is no essential difference between the two methods of development.

Remarks.—*B. perplexum* differs from *B. bohemicum*, described below, by its widely trochoid shape, the number of major septa, the form of its dissepiments, and by the thin aulos wall.

Horizon and Locality.—Bráník Limestones, *gα*, Hlubočepy Valley (the *precise* stratigraphical occurrence is unknown). Ancenis Basin, France.

Barrandeophyllum bohemicum, sp. n. (Pl. II. figs. 6–8; Pl. III. figs. 17–19; text-figs. 5 & 6.)

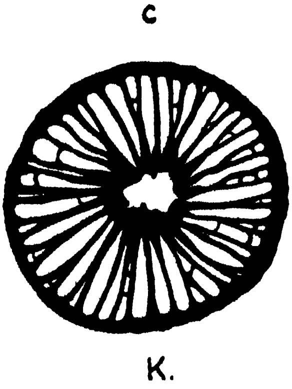
Holotype (here designated).—The specimen figured on Pl. III. figs. 17 & 19. Zlíchov Limestones, $g\alpha_3$, Hlubočepy, Kettner's Coral Reef. Barrandeum National Museum, Praha.

The holotype is distally and proximally incomplete. The septa are visible on the fractured proximal surface and in the calicular platform. Length 26 mm., maximum diameter 20 mm.

Description.—The corallum is trochoid and sometimes curved. Annular rugosity is feeble, but interseptal fluting is very strong. The calice is very deep, and has steep sides. Rejuvenescence and peripheral increase may occur.

Internal Structure.—The major septa are thin and are radially arranged in the adult stage (about 35). The minor septa are usually long, typically two-thirds the length of the major septa; their axial ends may abut against the major septa or be free. Aulos completely formed, but irregular, elliptical in section, with thickened wall. The tabulæ inside the aulos are complete, flat or slightly concave, and are irregularly spaced (5–9 tabulæ in a length of 5 mm.). The tabulæ outside the aulos are similar to those inside, but are more or less inclined to the periphery. The dissepiments are large and vary in number.

Text-fig. 5.



Text-fig. 6.

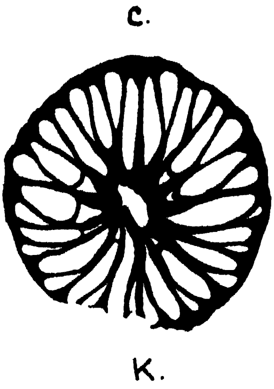


Fig. 5.—*Barrandeophyllum bohemicum*, sp. n. Sketch from thin section of a specimen from the Zlíchov Limestones, $g\alpha_3$, Hlubočepy.

Fig. 6.—*Barrandeophyllum perplexum* Počta. Sketch from thin section of a specimen from the Bráník Limestones, $g\alpha$, Hlubočepy. C, cardinal; K, counter. (Neanic stages.)

Note on the Septal Development.—In the younger stages of the coral the septa are apparently pinnate in symmetry. The cardinal septum is slightly longer than the metasepta. The counter-septum is at all stages flanked by two counter-lateral minor septa, which, as in *B. perplexum* and in some species of *Syringaxon*, attain in the ephebic stage the same length of the major septa, and can thus be clearly distinguished from the other minor septa. The number of septa in the major cycle in each of the four quadrants is always constant, in the younger stage usually three (excluding the two counter-laterals). In exceptional cases, however, there are more septa in the cardinal- than in the counter-quadrants. In some, usually large, specimens, the gerontic stage is present just as in some species of *Syringaxon*. The aulos disappears in the calicular floor, and the septal arrangement alters, proceeding from the radial arrangement of the ephebic stage backwards again to the pinnate arrangement of the younger stages. The cardinal septum is free, and slightly longer than the metasepta. The other protosepta, with the exception of the counter, are also generally free. The other major septa, on the contrary, are regularly connected by their axial ends generally in pairs to form a horseshoe-shaped tube.

Note on the Aulos.—In transverse section the aulos corresponds in structure to the "*stereotheca*" of Grabau (1922, p. 19). Only the axial ends of some of the protosepta extend into the aulos as in *Laccophyllum accuminatum* (Simpson, 1900, p. 202, text-fig. 9). The wall of the aulos is very thickened in the tangential sections, and the aulos itself shows a structure similar to the "*cyathotheca*" of Grabau (1922, p. 19). This again confirms Butler's view (1935, p. 123) that there is no essential difference between the various ways in which the aulos originated.

Remarks.—*B. bohemicum* differs from *B. perplexum* by the number of the major septa, the arrangement of the tabulæ inside the aulos, and by the form of dissepiments.

Horizon and Locality.—Zlíchov Limestones, $g\alpha_3$, Hlubočepy, "Kettner's Coral Reef, by the Little Chapel, in the first quarry beyond the last houses of Hlubočepy, on the road to Malá Chuchle. Zmrzlík. Daleje Shales, $g\beta$, Hlubočepy.

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EXPLANATION OF THE PLATES.

All figures natural size.

PLATE I.

Syringaxon bohemica bohemica (Barr.) (p. 23).

Fig. 1. Lectotype, side view. Daleje Shales, $g\beta$, Hlubočepy.

Syringaxon bohemica barrandei, sp. n. (p. 26).

Fig. 2. Holotype, calicular view, gerontic stage. Hlubočepy Limestone, $g\gamma$, Holyně.
Fig. 3. Holotype, side view.

Syringaxon carens, sp. n. (p. 28).

Fig. 4. Holotype, calicular view. Zlíchov Limestones, $g\alpha_3$, Hlubočepy.
Fig. 5. Holotype, calicular view.

Syringaxon inopinata, sp. n. (p. 31).

Fig. 6. Holotype, side view. Dvorce Limestones, $g\alpha$, Konvařka.

Syringaxon memorabilis, sp. n. (p. 30).

Fig. 7. Holotype, calicular view. Hlubočepy Limestones, $g\gamma$, Holyně.
Fig. 8. Holotype, side view.

Syringaxon smithi, sp. n. (p. 29).

Fig. 9. Holotype, side view. Zlíchov Limestones, $g\alpha_3$, Hlubočepy.
Fig. 10. Holotype, calicular view.
Fig. 11. Paratype, calicular view. Zlíchov Limestones, $g\alpha_3$. Hlubočepy.
Fig. 12. Paratype, same specimen, side view.

PLATE II.

Syringaxon alleynioides, sp. n. (p. 32).

Fig. 1. Holotype, side view. Hlubočepy Limestones, $g\gamma$, Holyně.

Syringaxon depressa, sp. n. (p. 33).

Fig. 2. Holotype, side view. Hlubočepy Limestones, $g\gamma$, Holyně.
Fig. 3. Holotype, calicular view.

Syringaxon excelsus (Ludwig).

Fig. 4. Specimen in Geol. Landesmuseum, Berlin. Side view. Upper Devonian. Einsensteinlager, Westfeld d. Gruge Königszug, Germany.

Barrandeophyllum perplexum Počta (p. 35).

Fig. 5. Lectotype, side view. Bráník Limestones, *gα*, Hlubočepy.

Barrandeophyllum bohemicum, sp. n. (p. 36).

Fig. 6. Holotype, calicular view. Adult stage. Zlíchov Limestones, $g\alpha_3$, Hlubočepy.
Fig. 7. Holotype, side view.
Fig. 8. Paratype, calicular view. Gerontic stage. Zlíchov Limestones, $g\alpha_3$, Hlubočepy.

PLATE III.

Syringaxon bohemica bohemica (Barr.) (p. 23).

Fig. 1. Longitudinal section. Daleje Shales, *βg*, Hlubočepy.
Fig. 2. Transverse section. Zlíchov Limestones, $g\alpha_3$, Hlubočepy.
Fig. 3. Transverse section. Zlíchov Limestones, $g\alpha_3$, Hlubočepy.
Fig. 4. Transverse section. Daleje Shales, *gβ*, Hlubočepy.

Syringaxon bohemica barrandei, sp. n. (p. 26).

Fig. 5. Longitudinal section. Hlubočepy Limestones, *gγ*, Holyně.

Syringaxon carens, sp. n. (p. 28).

Fig. 6. Transverse section. Zlíchov Limestones, $g\alpha_3$, Hlubočepy.
Fig. 7. Longitudinal section. The same horizon and locality.

Syringaxon smithi, sp. n. (p. 29).

Fig. 8. Transverse section. Zlíchov Limestones, $g\alpha_3$, Hlubočepy.
Fig. 9. Longitudinal section. The same horizon and locality.

Syringaxon excelsus (Ludwig).

Fig. 10. Longitudinal section. The same horizon and locality as Pl. II. fig. 4.

Syringaxon memorabilis, sp. n. (p. 30).

Fig. 11. Longitudinal section. Hlubočepy Limestones, *gγ*, Holyně.
Fig. 12. Transverse section. The same horizon and locality.

Barrandeophyllum perplexum Počta (p. 35).

Fig. 13. Transverse section. Bráník Limestones, *gα*, Hlubočepy.
Fig. 14. Transverse section. Cut from the same specimen.
Fig. 15. Longitudinal section. The same horizon and locality.
Fig. 16. Transverse section. The same horizon and locality.

(Figs. 13 and 14 are the originals of Počta, 1902, pl. cxviii. figs. 4–5.)

Barrandeophyllum bohemicum, sp. n. (p. 36).

Fig. 17. Longitudinal section. Zlíchov Limestones, $g\alpha_3$, Hlubočepy.
Fig. 18. Transverse section. Same horizon and locality. Same specimen as Pl. II. fig. 6.
Fig. 19. Longitudinal section. Same horizon and locality.

IV.—*New Brazilian* Curculionidæ (*Col.*).

By Sir Guy A. K. Marshall.

The types of the following new species have been deposited in the British Museum.

Subfamily *Cylindrorrhininæ.*

Ctenomyophila hambletoni, sp. n.

♀.—Testaceous-brown to red-brown, with yellowish setæ, but devoid of scaling except for dense yellow scales on the scutellum.

Head with close punctures, which are much coarser on the forehead. *Rostrum* very stout, shorter than the prothorax, strongly curved dorsally, with strong close punctures, which are subconfluent especially towards the apex, but without carinæ or striolæ; the setæ rather long, suberect, curved, and spatulate. *Antennæ* short and stout; funicle with joints 2–7 all transverse and very gradually widening distally, 7 annexed to the club. *Prothorax* moderately widened and rounded anteriorly, shallowly and narrowly constricted at the apex, arcuate at the base; the dorsum closely and strongly punctate, the intervals much narrower than the punctures and mat, without any median costa or smooth line; the dense stout curved setæ suberect on the disk and erect laterally. *Elytra* parallel-sided from the shoulders to beyond the middle, jointly sinuate at the base; the deep broad striæ containing rather large separated punctures; the intervals slightly convex, smooth, and impunctate, with two irregular rows of short recumbent setæ and one row of long stout curved erect setæ. *Legs* short and stout, with rather dense thick setæ; the front tibiæ bisinuate beneath, the corbels of the hind pair scarcely ascending the tibiæ, their dorsal edge being scarcely longer than the apical. *Underside* not granulate, but with separated punctures, each containing a broad recumbent yellow seta.

Length 4·0–4·7 mm., breadth 1·7–2·1 mm.

Brazil: Campinas, S. Paulo, 6 ♀♀, found in cotton refuse, x. 1935 (*E. J. Hambleton*).

Allied to *C. brasiliensis*, *hirtella*, and *vicina*, Hust. 1926. *C. brasiliensis*, however, has the rostrum subcarinate apically, joint 7 of the funicle is not annexed to the club, the prothorax is transversely impressed in front and has a raised impunctate median line, and the intervals of the elytra are transversely rugose. *C. hirtella* has the rostrum striolate and carinulate, the prothorax has a raised impunctate median line, the intervals of the elytra are densely rugosely punctate, and the corbels of the hind tibiæ ascend the dorsal edge. *C. vicina* has the intervals on the pronotum shiny, the scutellum is pubescent, and the intervals of the elytra have a single irregular row of setæ.

Subfamily *Erirrhininæ*.

Spermologus copaiferæ, sp. n.

♂♀.—Derm red-brown, rather thinly clothed with small narrow pale brown scales more or less mixed with fuscous ones.

Head with dense rugose punctation, the forehead a little depressed below the level of the vertex, slightly wider than the base of the rostrum; eyes rounded beneath, separated by the width of the 6th funicular joint. *Rostrum* as long as the pronotum, gradually narrowing from the base to the antennæ, which are inserted at the middle (♀) or a little beyond it (♂), the apical part parallel-sided (♂) or shallowly sinuate laterally (♀); the dorsum on the basal half with six strongly punctate shallow sulci separated by low narrow carinæ, the apical part with strong dense punctures in ♂, sparser in ♀. *Antennæ* stout, red-brown; funicle with the two basal joints subequal, the rest more or less transverse, at most as long as broad, 7 much shorter than the club. *Prothorax* transverse (3 : 4), only slightly rounded laterally, widest at about the middle, very abruptly narrowed in front, with a narrow apical constriction, the base shallowly bisinuate; the dorsum convex longitudinally and transversely, with comparatively small dense punctures, usually without any trace of a median impunctate line, with a short median sulcus in the middle of the base in ♀, which is much less distinct in ♂; each puncture with a recumbent setiform brown scale. *Elytra* subquadrate (6 : 5), shallowly sinuate at the base, with prominent rounded shoulders, almost parallel-sided from there to beyond the middle and broadly rounded behind; the striæ deep, with strong catenulate punctures throughout; the intervals broader than the striæ, almost flat, rugosely punctate, with small narrow scales and numerous irregular short stout subrecumbent setæ. *Legs* stout, coarsely punctate, with short subrecumbent pale setæ.

Length 5·0–5·5 mm., breadth 3·0–3·3 mm.

BRAZIL: Bahia, 3 ♂♂ 1 ♀, bred from seeds of *Copaifera*, viii.–ix. 1937 (*Dr. G. Bondar*).

Tiphaura rolliniæ, sp. n.

♂♀.—Piceous-black, opaque, almost bare above; the middle of the sternum and the sides of the venter with fulvous scales.

Head coarsely punctate, with some fulvous scales on the vertex and a very shallow frontal fovea; the space between the eyes beneath as wide as the apex of the 2nd funicular joint *Rostrum* as long as the head and pronotum, gently curved, subcylindrical, widening at the base and apex, with the antennæ inserted at one-fifth from the base; the basal part with two very shallow short median sulci, the anterior part strongly punctate (less so in ♀), with a broad median impunctate stripe and on each side a deep sulcus from near the antennæ almost to the apex. *Antennæ* with the scape much shorter than the two basal joints of the funicle, of which joint 2 is longer than 1, the rest more or less transverse, 7 as long as the shiny basal joint of the club. *Prothorax* transverse (3 : 4), rounded laterally, widest at about the middle, very strongly narrowed near the apex, with a narrow apical constriction, the base arcuate, the dorsum moderately convex transversely, with isolated larger shallow punctures and numerous slightly smaller ones between them, without any median impunctate line, but with a round impression on each side of the disk behind the middle and an indefinite shallow impression in the middle of the base. *Scutellum* very small. *Elytra* a little longer than broad, very broadly ovate, jointly sinuate at the base, gradually narrowing from a short distance behind the shoulders, broadly rounded at the apex; the very shallow striæ with distinct punctures separated by more than their diameters, stria 9 deeply impressed on the apical two-thirds; the intervals broad, smooth, with numerous irregular isolated punctures containing minute recumbent setæ. *Legs* stout, with fairly close shallow punctures, and with dense fulvous scaling and stout erect setæ on the upper and lower surfaces.

Length 6–7 mm., breadth 4·0–4·5 mm.

BRAZIL: Matto Grosso, 4 ♂♂, 1 ♀, bred from seeds of *Rollinia* sp. (Anonaceæ), 1926 (*Dr. C. Moreira*)

In 1930 (Ann. & Mag. Nat. Hist. (10) vi. p. 575) I sank *Tiphaura* Pasc., 1871, as a synonym of *Spermologus* Boh.; with additional material I am now satisfied that the two genera are quite distinct. The five known species comprised in them can be distinguished as follows:—

1 (6). Antennæ inserted at or beyond middle of rostrum, scape much longer than two basal joints of funicle, basal joint of club shorter than the rest together; third joint of tarsi broadly bilobate, much wider than second, entirely clothed beneath with dense spongy pubescence; upperside with normal scales or setæ . . . SPERMOLOGUS Boh.

2 (5). Rostrum longer than prothorax (9 : 7), its lower surface with a strong complete median carina; joint 7 of funicle a little longer than broad.

3 (4). Forehead transversely impressed at base of rostrum; eyes rather sharply acuminate beneath, separated by the width of the antennal club; apical constriction of prothorax continued across disk . . . . *impressifrons* Mshl.

4 (3). Forehead not thus impressed; eyes more broadly rounded beneath, the space between them as wide as the third funicular joint; constriction of prothorax not continued across disk . . . . *rufus* Boh.

5 (2). Rostrum not longer than prothorax, its lower surface without a median carina; joint 7 of funicle transverse . . . . *copaiferæ*, sp. n.

6 (1). Antennæ inserted close to base of rostrum, scape not longer than two basal joints of funicle, basal joint of club twice as long as the rest together; third joint of tarsi scarcely bilobate, hardly wider than second, its lower surface not spongy but with a tuft of soft hairs in each apical angle; upperside with the scales or setæ absent or so minute that they do not exceed the punctures in which they lie. . TIPHAURA Pasc.

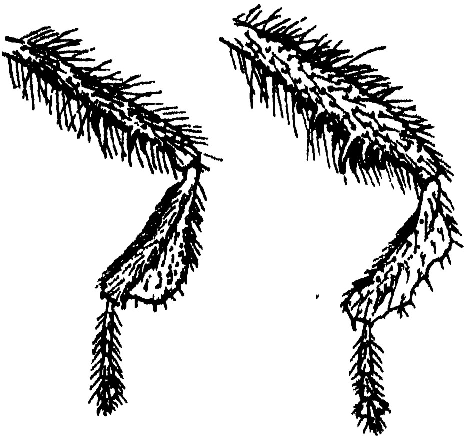
7 (8). Scape about as long as two basal joints of funicle, which are equal; space between eyes beneath only half as wide as joint 2 of funicle; pronotum with an abbreviated impunctate median line. *funerea* Pasc.

8 (7). Scape much shorter than two basal joints of funicle, joint 1 being much shorter than 2; space between eyes beneath as wide as joint 2 of funicle; pronotum without any impunctate median line .... *rolliniæ*, sp. n.

Subfamily *Tachygoninæ*.

Tachygonus bondari, sp. n.

Shiny black, without any markings or scaling dorsally; rostrum red-brown, antennæ and anterior pairs of legs flavous; underside with the sides of the sternum clothed with finely pectinate subrecumbent white scales, which are formed of 2–6 elongate white setæ united at the base.



Hind legs of *Tachygonus bondari*, sp. n. (left), and *T. luminicrus*, sp. n. (right).

Head finely aciculate, with small separated punctures, and a patch of pectinate white scales behind the lower half of the eyes. ***Rostrum*** shiny and impunctate dorsally, with two irregular rows of strong confluent punctures on each side. ***Antennæ*** with the first joint of the funicle longer and much thicker than the scape. ***Prothorax*** with large close punctures laterally and at the base, the punctures on the disk much smaller and sparser, and with a broad median impunctate space; the long black erect setæ evenly distributed, not forming tufts. ***Elytra*** broadly cordate, slightly broader than long, quite flat dorsally as far as stria 4, the shoulders and posterior calli not very prominent; the broad striæ with large subquadrate punctures, the narrow septa between them a little lower than the intervals and each bearing a long erect dark seta; the intervals narrower than the punctures, sinuous, the alternate ones slightly higher and with a row of small distant granules bearing an erect dark seta. *Legs* (see figure) with the elongate hind femora narrow and cylindrical (not clavate), rugosely granulate, with three long teeth on the apical half of the lower edge (two on one side and one on the other) and many small ones; the hind tibiæ with the lower edge gently curved and set with a dense row of small granules, the dorsal edge bearing a broad lamina, widest at one-third from the apex and with its margin strongly and regularly curved.

Length 3 mm., breadth 2·5 mm.

Brazil: Bahia, four specimens, on leaves of a Myrtaceous plant, 1937 (*Dr. G. Bondar*).

Distinguished from previously described species of the genus by the laminate hind tibiæ, the uniform black coloration, and the absence of dorsal tufts.

Tachygonus laminicrus, sp. n.

Red-brown with the head black; the rostrum, antennæ, anterior pairs of legs, and hind tarsi testaceous; the metasternum and hind femora piceous; the elytra with a small sutural patch of white setæ just behind the scutellum; sternum with only a few pectinate white scales laterally.

Head with small dense punctures, and a patch of pectinated white scales behind the eyes. *Rostrum* as in *T. bondari*, sp. n. *Antennæ* with joint 1 of the funicle nearly as long and as thick as the scape. *Prothorax* with close large punctures throughout, except on a short median impunctate stripe; the erect brown setæ evenly distributed, not forming tufts. *Elytra* broadly cordate, as broad as long, flat dorsally as far as stria 4 but with a depression near the base between intervals 1 and 3, the humeral callus somewhat elevated; the broad striæ with large subquadrate punctures, all the intervals and septa granulate and setigerous, intervals 3 and 5 more raised at the base, the lateral intervals very rugose, 9 being elevated into a closely and sharply granulated ridge. *Legs* (see figure) with the hind femora distinctly clavate, rugosely granulate, with an uneven row of about five longer teeth on each side of the lower surface and many small ones; the hind tibiæ with the lower edge curved at the base but straight distally and finely granulate, the dorsal edge bearing a high laminate ridge, the margin of which is variably sinuate but approximately parallel with the lower edge of the tibia for most of its length.

Length 3·0–3·5 mm., breadth 2·2–2·5 mm.

BRAZIL: Rio de Janeiro, 2 specimens (*A. Fry*).

Subfamily CRYPTORRHYNCHINÆ.

Gasterocercodes sidæ, sp. n.

♂♀.—Derm black to piceous-brown; head and rostrum without scaling; prothorax with three very indefinite and irregular stripes formed of large grey scales (often more or less abraded), the median one the narrowest; elytra with dense grey scaling and with vague and irregular darker markings, especially along the suture; underside setose, with a very few sparse suberect scales.

Head with very coarse subconfluent punctation, without any frontal fovea. *Rostrum* about as long as the prothorax, very stout, rather strongly curved dorsally, gradually widening from base to apex, punctate like the head, with a short impunctate median line on the apical half. *Prothorax* transverse, strongly rounded laterally, widest at about the middle, gradually narrowing to the base, more rapidly so to the apex, with a distinct apical constriction which is very shallowly continued across the disk; the apical margin arcuate, the base bisinuate, with a median angulation; the dorsum convex longitudinally, highest behind the middle, with very large reticulate punctures, the narrow intervals between them being mat at the base and becoming shiny anteriorly, without any smooth median line; the scales very large, the setæ short, dark, and subrecumbent on the disk, suberect laterally, and with elongate pale setæ near the apex, some of which project beyond the margin. *Scutellum* ovate, bare, mat. *Elytra* 1·3 times as long as broad, almost parallel-sided from the shoulders to the middle, obtusely rounded at the apex, with a deep subapical constriction; the dorsal outline rising gradually from the base to the middle, then sloping more rapidly to the apex; the broad shallow striæ containing large unequal separated punctures, the intervals being narrow and rugulose, but the details of the sculpture are hidden by the broad scales, which partly conceal the punctures and make the intervals appear broader than they really are; each interval with a row of short stout suberect setæ, partly black and partly whitish. *Legs* coarsely punctate, with sparse elongate pale scales and pale setæ; tibiæ strongly carinate dorsally and with a sharp dorsal angulation near the base.

Length 4–5 mm., breadth 2·0–2·5 mm.

BRAZIL: Campinas, S Paulo, 3 ♂♂, 5 ♀♀, bred from *Sida cordifolia* (Malvaceæ), iv. 1936 (*E. J. Hambleton*).

Readily distinguished from the genotype (the only other known species of the genus), *G. gossypii*, Pierce 1915, by its coarse sculpture, large scales, conspicuous erect setæ, and by its angulate tibiæ

SYNONYMY.

Recently three new species of Brazilian Cholinæ have been described by Messrs. F. Lane and J. Moure (Rev. Mus. Paulista, xxiii. 1938, pp. 615–630), and their very detailed descriptions and excellent illustrations leave no doubts as to the following synonymy:—

"*Abebæus*" (*crassus* L. & M.)=*Cholus miliaris* Oliv., 1790.

(*Oreopeplus* L. & M.)=*Sclerosomus* Schönh. 1836.

(*O. badius* L. & M.)=*S. coccosus* Fhs., 1844.

V.—*Some Notes on Stag-beetles* (Lucanidæ) *and Descriptions of a few new Species*. By GILBERT J. ARROW (British Museum (Natural History)).

[Plate IV.]

IN view of the astonishing range of variation to which the males of the Lucanidæ are subject, as revealed by the great series now in various museums resulting from many years' collecting, it is not surprising that the group has suffered more than most from an excessive multiplication of names, such variability having been quite naturally unsuspected by the early systematists. The troublesome task which falls to their successors, of collecting and giving decent burial to the superfluous names devised with such pleasant emotions by their predecessors, carries with it a salutary warning of the similar fate which perhaps even extremest circumspection will hardly enable ourselves to escape. Failing opportunities for devising new specific names there is a present tendency to resort to the creation of generic (or subgeneric) names. Every genus which contains more than one species is capable of subdivision, and great genera such as *Aphodius* and *Onthophagus*, which include many hundreds of species, offer an immense field for such activities; but these can only be deplored when they result in the addition of useless names to the already immense list of insect genera. The subdivisions can be conveniently designated by numbers or by the name of a typical species. Names for subgenera are not only unnecessary but a nuisance, for subdivisions of the same genus may be based by different systematists on different characters, and the method found best for the species occurring in a particular region is often not the same as that adopted by the same or another systematist for another region.

There is perhaps no group of insects in which a convenient system of classification will entail the discarding of so many generic and subgeneric names as the Lucanidæ, the features on which a very large proportion have been based being found neither in female specimens nor in small males.

In a recent memoir upon the Lucanidæ (Stett. Ent. Zeit. xcvii. p. 293 (1936)), Herr P. Nagel has formed a new genus, *Cyclommatellus*, which he distinguishes from *Cyclommatus* by two features—the presence of a hollow limited by carinæ upon the head of the male and the sixth antennal joint not longer than those which follow it. From analogy with related forms we know that neither of these distinctive features exists in the females, and, moreover, both vary according to the size of the male. Herr Nagel has refrained from stating which of the previously described species of *Cyclommatus* belong to his new genus, probably because some are not represented in his collection by specimens of sufficient size to indicate whether they do or not. The genus *Cyclommatinus*

(Didier, Bull. Soc. Ent. France, 1927, p. 103) is in precisely the same case. The features on which it is based are found in males alone, and only in large specimens of that sex. In both cases, although the groups may be natural, it is obvious that their separation under distinct names merely introduces new difficulties into nomenclature. These and many similar names can be abandoned with advantage.

The remarkable Lucanid group Syndesinæ is represented only by a few species found in Australia, New Caledonia, and S. America. They are so closely alike that Burmeister (Handb. Ent. v. p. 332, 1847) refused to recognize them as forming two genera, referring all to the genus *Syndesus*. The genus *Hexaphyllum* has, in spite of this, been maintained for the S. American forms, which have six lamellæ in the antennal club, while the two Australian forms have an additional elongated joint. Two species found in New Caledonia have only six elongate joints, and must therefore be assigned to *Hexaphyllum* if it is to be retained. The unquestionably close relationship of all six species, however, renders such separation wholly unnatural. Like other genera of various groups occurring both in Australia and S. America, such as *Læmosaccus*, *Cheiroplatys*, and *Heteronyx*, these forms indicate a very remarkable fact in distribution which should not be concealed by an artificial separation. If other artificial genera, based chiefly upon geographical considerations, were abandoned, various striking instances of the same kind would probably be revealed.

A supposed new genus was formed in 1909 by Boileau for an African species which he called *Cardanopsis bicolor*. The type of this, which has been kindly sent to me for examination by Dr. Lundblad, of the Stockholm Museum, has proved to be a female of the peculiar African genus *Xiphodontus*, of which only a single S. African species has been previously known. The two sexes in the Lucanidæ differ so greatly that there is especial danger of founding genera upon features peculiar to one sex. Boileau was quite wrong in associating his species with *Cardanus*, with which *Xiphodontus* has no very near relationship.

In Van Roon's Catalogue seven species are referred to the genus *Chiasognathus* and fifteen to *Sphenognathus*.

Parry selected as the critical feature for the separation of the two genera the slender and downward-bent mandibles of the former. Not only does this feature fail entirely with all females and small males, but it fails to provide any definite point of divergence, every stage of transition occurring between the long deflexed mandibles of *Chiasognathus granti*, the type of the former genus, and the much shorter and straighter mandibles of *Sphenognathus prionoides*, type of the latter. There is a positive character, however, in which both sexes of the very extraordinary *Chiasognathus granti* differ generically from all the rest, viz., the possession of a stridulatory apparatus. The inner edge of the elytral epipleura is thickened and provided with very fine and close transverse ridges, which are played upon by correlated ridges upon the hind femora. This apparatus appears to be confined to the single species, which, so far as is known, is the only Lucanid capable of stridulating in the adult stage. The other forms attributed to the genus should, in my opinion, be transferred to *Sphenognathus*.

In a note (Ann. & Mag. Nat. Hist. (10) xvii. p. 150) dealing with the peculiar Lamellicorn genus *Chiron*, I referred *Diasomus sulcithorax* Perty, hitherto associated with that genus, to the Lucanid genus *Figulus*. A further study of Perty's description has convinced me that his insect is actually the type-species of the closely related genus *Cardanus*, *C. sulcatus* Westw., which must therefore be called *C. sulcithorax*.

Cardanus lævigatus Deyr. (=*tamburan* Kriesche).

This species, recorded by Kriesche from Northern New Guinea and New Britain, was ascribed by Deyrolle to the Moluccas and Philippines. It appears, therefore, to have a rather wide distribution, but the Philippine attribution requires confirmation. A specimen taken by Miss Cheesman at Kokoda, E. New Guinea, agrees with Deyrolle's description, and the supplementary remarks of Kriesche do not appear to me to indicate that his specimens are specifically distinct.

By the kindness of Dr. Sachtleben I have been able to examine the type, from the Deutsches Entom. Inst. Dahlem, of *Figulus napoides* Kriesche, a redundant name due to a mistake. The specimen, from the

Kraatz collection, is labelled "*Figulus insularis* Blanch., Taiti," but the other side of the label bears the word "Singapore."

Unfortunately, Herr Kriesche appears to have seen only the wrong side of the label, for the specimen was correctly determined as *insularis*, a synonym of *foveicollis* Boisd., and was evidently taken in Tahiti.

Another species of *Figulus*, *F. liliputanus* Westw., has as a synonym *papuanus* Gestro. It is an abundant insect of wide distribution.

Nigidius rhodesianus, described and figured by me in 1936 (Trans. R. Ent. Soc. vol. lxxxiii. p. 119), was described by Péringuey under the same name in 1908 (Trans. S. Afr. Phil. Soc. xiii. p. 547). The reference was omitted from Van Roon's catalogue of 1910 and was overlooked by me in consequence.

Mesotopus regius. Mollenkamp has figured under this name a well-developed male example of *M. tarandus* Swed. with the mandibles long and little curved. It perhaps represents the highest development attained in this sex, but, as every stage of transition in the mandibles appears to exist, it does not merit a distinct name.

I believe the insect described and figured by Boileau ('Le Naturaliste,' xix. 1897, p. 287) under the name *Metopodontus planeti* to be a well-developed specimen of the species of *Dorcus*, of which a small specimen served as type, called *M. swanzianus* by Parry in 1870.

I have recorded that *Dorcus opacipennis* Zang is identical with *D. suturalis* Westw. Since in my opinion *Lucanus suturalis* Oliv. is also a member of this genus, Westwood's name must be replaced by *opacipennis*. *D. rotundopunctatus* Nagel, the type of which Dr. W. Horn has kindly enabled me to compare with Westwood's type, belongs also to this species.

The type, in the Calcutta Museum, of *Dorcus yaksha* Gravely, which I have been enabled to examine, is a small male of *D. antæus* Hope, and another dwarfed male specimen of the same species was described and figured by Boileau under the name *Rhætus parryi*.

Dorcus travancoricus Gravely has proved upon examination to be synonymous with *D. rugosus* Boil.

In a recent memoir, "Dimorphism in the Males of Stag-beetles" (Trans. R. Entom. Soc. lxxxvi. 1937, p. 242), I mentioned a Celebes form, *Calcodes stevensi*, as amongst those species exhibiting two separate male phases. This species is notable also for colour dimorphism in the sexes, the male being entirely black and the female having a broad orange stripe on each side. A male specimen of the variable phase in the British Museum collection, taken by G. Heinrich at Tanka Salokko in South-east Celebes (4500 feet elevation), has a broad yellow border like that normally distinctive of the other sex, but of a paler colour. It is a large male representing the full development of the variable phase. Whether this indicates an occasional tendency of the male to assume the female coloration, or represents a local race there is no evidence at present. Kriesche's subspecific name *limbatus* applied to two yellow-bordered specimens the sex of which he has not mentioned seems a little premature. Fifteen males of this Celebes species known to me include only two of the constant phase, in which the basal half of the mandibles is without teeth.

Another striking case of sexual dimorphism is presented by *Dorcus histrio*, described by me from males only (Trans. Ent. Soc. lxxxiii. 1936, p. 109). The male is elongate, with a dull surface, and bright yellow in colour, with the head black, three longitudinal black stripes on the pronotum, and a narrow black sutural stripe upon the elytra. The female, of which I have seen only a single specimen, has no resemblance at all to the male. It is shortly oval, very glossy, and dark, with the outer half of each elytron yellow and a triangular common dark patch extending from the shoulders to the apex. This female form bears a close superficial resemblance to that of *D. speciosus* Boil., which inhabits the same region, but has numerous points of difference. *D. histrio* has a similar sharply contrasted yellow and black coloration, but the lateral yellow stripe is less parallel-sided and the black elytral patch tapers evenly from shoulders to apex. The mandibles are more strongly curved, the eyes smaller and more divided by the canthus, the pronotum less closely punctured at the sides, narrowed behind, its lateral margin sharply angular beyond the middle and gently concave behind. The elytra are shorter and more numerously punctured, the sides densely punctured and not shining. The prosternum is not pointed behind, the front tibia ends in a broad bluntly lobed process and the middle and hind tibiæ have a stronger lateral spine upon each.

The specimen described was seen by Boileau and labelled by him as a female of *speciosus* Boil., with which he evidently had not the opportunity of making a careful comparison. That it is actually *D. histrio*, in spite of its dissimilarity to the male, appears to me almost certain. In *D. speciosus* the metasternum in both sexes has a yellow spot, roundish in outline, on each side. In *D. histrio* a triangular yellow patch occupies the anterior angle of the metasternum. This is found in male and female. The prosternum of *D. speciosus* is sharply pointed behind. In both sexes of the other species it is rather quadrate. Finally, upon the black pronotum of the female here described are visible certain rather obscure deep red markings. These occupy approximately the position of the four yellow patches decorating the thorax of the male.

The female was taken by Mrs. Imray at Pirmaid, Travancore, South India.

M. Boileau rightly recognized the existence of two very closely related Indian species with peculiar tufts of brown setæ upon the upper surface, one of which had been named *Dorcus velutinus* by Thomson (Pl. IV. fig. 6). It is unfortunate that, in the absence of the type-specimen, he applied Thomson's name to the wrong one of these and gave the new name *cinereus* to *D. velutinus*, leaving the new species still nameless. Having been enabled by M. Oberthür to examine the true *Dorcus velutinus*, I am able to repair the mistake. Boileau rather strangely transferred these insects to the genus *Gnaphaloryx*, but Thomson was not mistaken as to their real affinity. Despite the distinctive clothing of rough setæ they are rather nearly related to *Dorcus parallelopipedus*, the type of its genus.

I propose to call the unnamed species

Dorcus ursulus, sp. n. (Pl. IV. fig. 5.)

Fusco-niger, corpore subtus pedibusque griseo-pubescentibus, corpore supra setis erectis brunneis vestito; elongatus, parum convexus, supra scabrosus, pedibus antennisque brevibus; oculis fere divisis, pronoto lato, lateribus haud dentatis, angulis posticis rotundatis; elytrorum humeris

haud angulatis, setarum lineis haud anticе integris sed breviter penicillatis instructis :

♂, mandibula brevi, ante apicem intus dente truncato armata, labro lævi impunctato :

♀, tibia antica apice late producta, palmata, supra dente obtuso armata.

♂. Long. (cum mandibulis) 23–26 mm., (absque mand.) 20–23 mm.; lat. max. 8·5–10 mm.

♀. Long. 19 mm.; lat. max. 8 mm.

N. INDIA : Pedong, Darjeeling Distr. (*L. Durel*).

This has been described from two males and a female submitted to me by M. René Oberthür, who has generously allowed the type-specimen to be retained in the British Museum collection.

It is a rather shorter and broader insect than *D. velutinus*, and the longitudinal lines upon the elytra, formed by upstanding brown setæ, are not continuous, as they are upon the anterior half of the elytra in *velutinus*, but consist entirely of separate short tufts. These features are common to both sexes. In addition, as mentioned by Boileau, the mandible of the male, instead of a gradual dilatation of the inner edge, as in *velutinus*, has an abrupt tooth, truncate at the end, placed shortly before the tip. Full-sized males have the prothorax very broad and the outer edges not parallel, but diverging forwards.

The following new species is related to the last :—

Dorcus immundus, sp. n. (Pl. IV fig. 8.)

Niger, opacus, modice elongatus, parum convexus, oculis fere divisis, genis minute prominentibus, prosterno postice paulo compresso, angulato : ♂, paulo deplanatus, pedibus sat brevibus, capite brevi, plano, processu clypeali lato, brevissimo, mandibulis angustis, brevibus, intus dente obtuso ante medium instructo, pronoto toto obscuro, lateribus antice vix arcuatis, postice subtiliter concavis, angulis anticis haud acutis, posticis obtusis ; elytris inæqualiter punctatis et striatis ; corpore subtus crebre punctato, tibiis anticis minutissime denticulatis, posterioribus 4 inarmatis.

♂. Long. (cum mandibulis) 19–25 mm., (absque mand.) 16·5–20 mm.; lat. max. 7–9 mm.

♀. Long. 22 mm.; lat. max. 9 mm.

S. INDIA : Camp Valparai, Coimbatore, 3500 ft.

Four specimens of this insect have been submitted to me by M. Oberthür, who has kindly allowed the type to be retained by the British Museum.

Sooty-black, the surface very dull and closely sculptured above and beneath; moderately elongate, parallel-sided, the legs and antennæ short, the canthus long and narrowly separated from the cheek.

♂. Rather narrow, not very convex. The head is short and broad, the clypeal process very short and broad, the eyes very small, the sides with a very small prominence behind the eyes, which does not meet the canthus. The mandibles are short, strongly rounded, with a short truncate tooth placed beyond the middle on the upper surface. The pronotum is short, a little wider than the elytra, the sides a little rounded in front, with the front angles bluntly produced, straight to the lateral angles, which are sharp, and gently concave to the basal angles, which are very blunt but well marked. The elytra are distinctly but not evenly striate, with the base, sides, and apices closely punctured, the striæ and the intervals very irregularly punctured. The mentum is rugose, the prosternum slightly compressed and pointed behind, the metasternum closely and coarsely granular, and the abdomen closely punctured. The terminal fork of the front tibia is short but sharp, the middle tibia has a lateral spine, and the hind tibia has none.

Variation of the Male.—In a small specimen the head and pronotum are closely punctured and the mandibles scarcely as long as the head. Two larger males have the head only finely and lightly punctured and the mandibles a very little longer than the head.

♀. Moderately elongate, very convex. The head is very closely and rugosely punctured, the canthus narrow, very little separated from the cheek, but not laterally prominent. The pronotum is strongly and closely punctured dorsally, densely rugose at the sides. The front angle is rather sharp, the lateral margin rounded to the blunt lateral angle and gently concave to the distinct but very blunt hind angle. The elytra are very densely rugose, with the lateral margins serrate and with uneven costæ upon the anterior dorsal part.

This species is very closely related to *D. rugosus* Boil. (Pl. IV. fig. 9), but a little narrower in shape. The eyes, as in that species, are almost completely divided. The side margins of the prothorax, which in both sexes of *D. rugosus* are rather strongly concave behind, are here only very gently excised, so that the hind angles are less sharp and the lateral angle also is comparatively blunt. The prosternum is more prominent and angulate behind. The male is distinctly more elongate than that of *D. rugosus*, less convex and more parallel-sided. The mandibles attain a rather greater length and the tooth, which is of the same form, is placed before, instead of after, the middle. The pronotum is less coarsely sculptured and entirely dull, its side margins rather straight, and the front angles very blunt. The elytra are less rugose and distinctly striate.

Dorcus vernicatus, sp. n. (Pl. IV. fig. 7.)

♂. Niger, femoribus medio rufis, tarsis, tibiisque 4 posterioribus fulvo-pilosis; angustus, prothorace lato, capite et pronoto opacis, fere impunctatis, elytris glaberrimis, nitidis, capite brevi, plano, lateribus ante oculos fere parallelis, rectis, pone oculos leviter contractis, processu clypeali transverso, prominenti, margine antico recto, mandibulis brevibus, fortiter arcuatis, singulo intus dente valido, apice acuminato, paulo ante medium sito, armato; pronoto quam elytra multo latiore, lateribus reflexis, antice rectis, convergentibus, postice rotundatis, haud angulatis, angulis anticis productis, obtusis, scutello leviter punctato; elytris longis, angustis, lævibus, linea subsuturali punctorum minutorum paulo pone medium protracta, margine basali sat rugose punctato margineque laterali distincte haud dense punctato, humeris acute angulatis; pedibus gracilibus, tibia antica extus minute serrata, dentibus paulo majoribus nonnullis armata, tibiis 4 posterioribus muticis, tarsis subtus sat longe pilosis; prosterno postice compresso, angulato.

Long. (cum mandibulis) 19 mm., (absque mand.) 16 mm.; lat. max. 7 mm.

Assam: Shillong District.

I have seen only a single male specimen contained in M. René Oberthür's collection.

The close relationship of this little insect to *Dorcus nageli* and *humilis* is evident. It is of almost the same size and shape as the former, but the elytra are still more narrow and elongate and extremely glossy, instead of being, like the head and pronotum, dull black. The prothorax is very short and broad, as in *D. nageli*, but, together with the head, is scarcely visibly punctured and the sides are straight and convergent from near the base to the front angles, which are strongly produced but very blunt. The sides of the head in front of the eyes are more straight and parallel than those of *nageli* and the clypeal process is rather more prominent, with sharper angles. The mandibles are a little longer, the lobe at the inner edge is more developed, arises rather nearer the base and is produced to a sharp point. The legs and antennæ are more slender than those of the related species, and the middle and hind tibiæ are without the strong spine at the outer edge. The prosternum is more elevated and produced behind.

Figulus concatenatus, sp. n. (Pl. IV. fig. 3.)

Haud nitidus, ubique crebre punctatus, angustus, paulo depressus, capite medio leviter excavato, utrinque prope oculos tuberculato, lateribus regulariter arcuatis, postice lato; pronoto quadrato, vix transverso, ubique æqualiter crebre punctato, medio leviter longitudinaliter depresso et pone marginem anticum minute tuberculato, angulis omnibus paulo rotundatis, scutello nullo; elytris sat fortiter haud profunde striatis, intervallis planis, crebre, sat minute, plerumque uniseriatim punctatis; corpore subtus ubique crebre et fortiter punctato, mento leviter excavato; antennis 9-articulatis.

Long. 8 mm.; lat. max. 2·3 mm.

BORNEO, SARAWAK: Mt. Matang, 1000 ft. (*G. E. Bryant*, Nov.).

A single specimen was taken from a rotten log.

The very numerous species of this genus have, almost without exception, a shining upper surface, with deeply striate elytra and patches of strong punctures upon the pronotum. *Figulus cicatricosus* Boil., the entire upper surface of which is rough and dull, without definite punctures, is an isolated exception, and another is the present species. It shows no resemblance to *F. cicatricosus*, being of much more elongate form and more flattened above, and the surface, both above and beneath, is closely and rather evenly covered with fine punctures. The legs are rather short, the front tibiæ broad, and the four posterior tarsi short and thick. The head is more densely punctured than the rest of the surface and its sides are gently rounded. There is a shallow longitudinal depression at the middle of the pronotum, preceded by a very minute tubercle. The shoulders of the elytra are very prominent but not toothed, the dorsal striæ are of about equal width to the intervals, and each interval and stria has a single series of close punctures, except the second interval, which is rather wider and unevenly punctured. The colour of the unique specimen is a very deep red, with the antennæ, tibiæ, and tarsi black, but it is probable that other specimens are entirely black. This is the case with the Javanese species called *Figulus subcastaneus* by Westwood. Specimens taken by Mr. F. C. Drescher in Preanger, Java, are entirely black above. They exactly agree in other respects with the unique type in the Oxford Museum.

Figulus serratus, sp. n. (Pl. IV. fig. 2.)

Niger, nitidus, parum angustus, grosse punctatus, capite supra crebre rugoso-punctato, antice tuberculis tribus lævibus instructo, postice haud lato, lateribus regulariter arcuatis; pronoto paulo transverso, utrinque fortiter sat late punctato, lateribus et medio lævibus sed hoc toto anguste sulcato, sulco sat grosse et crebre punctato, marginibus lateralibus postice leviter arcuatis, fortiter serratis, angulis posticis fere rectis; elytris profunde sulcatis, sulcis crebre punctatis, intervallis convexis; metasterni lateribus abdomineque fortiter grosse punctatis, mento lævi, antice profunde excavato; antennis 9-articulatis.

Long. 7–8 mm.; lat. max. 2·5 mm.

BORNEO, SARAWAK: Retuh, Tabekang (*G. E. Bryant*, May).

There are three specimens in the British Museum collection.

This species has a considerable resemblance to *F. acutangulus* Arrow, from Tonkin, and, like it, has the lateral margins of the thorax strongly serrate, the hind angles acute, and the elytra strongly punctured, with narrow rounded intervals. It is rather smaller than *acutangulus*, the sides of the head are more strongly rounded and the base less broad, the pronotum is shorter and less deeply grooved in the middle, and the elytra are rather less coarsely punctured. The mentum is more deeply hollowed and very smooth instead of rugose. There is also a fairly close resemblance to the widely-distributed *F. liliputanus* Westw., but the prothorax is shorter, much more coarsely punctured and more strongly serrate at the sides.

Figulus cheesmani, sp. n. (Pl. IV. fig. 1.)

Niger, nitidus, angustus, convexus, capite lato, haud excavato, postice utrinque crebre punctato, leviter elevato, medio parce, parum fortiter punctato, carinis ocularibus antice bene elevatis, marginibus lateralibus regulariter arcuatis, reflexis, antice haud angulatis, postice obtuse angulatis; prothorace parum transverso, lateribus sat late et crebre, extus minute punctatis, medio haud sulcato sed anguste haud fortiter punctato, antice tuberculato, marginibus lateralibus antice rectis, fere parallelis, postice late rotundatis, minute serratis; elytrorum disco profunde striato, intervallis planis, lævibus, lateribus seriato-punctatis; corpore subtus medio lævi, lateraliter grosse sed parce punctato, mento postice crebre punctato, antice lævi, late excavato, margine antico fortiter bituberculato; antennis 10-articulatis. Long. 10 mm.; lat. 3·5 mm.

E. New Guinea: Kokoda, 1200 ft. (*Miss L. E. Cheesman*, Aug.).

The form is rather convex and cylindrical, the prothorax rather long and the head with gently and evenly rounded sides, as in *F. liliputanus*. It is a larger insect than the latter, has 10-jointed antennæ and a much smoother and flatter head, with fine and scattered punctures, except upon the two posterior elevations, which are widely separated. The pronotum has a narrow, finely punctured median area, which does not reach the front tubercle or the base, the sides are fairly closely punctured, the punctures minute externally, and there is no trace of hind angles. The elytra are deeply striate, with smooth flat intervals and scarcely visible punctures in the striæ. The mentum is strongly punctured upon its posterior half and deeply and broadly hollowed upon the anterior half, which is smooth with two well-marked tubercles not far apart at the anterior edge.

I have added to the Plate a figure (Pl. IV. fig. 4) of yet another Oriental species of this genus (*Figulus aratus*), from the Nilgiri Hills, South India, described by me in Trans. R. Ent. Soc. 1935, p. 119, but not previously figured.

Penichrolucanus leveri, sp. n. (Pl. IV. fig. 10.)

Rufopiceus, nitidus, oblongus, deplanatus, pedibus modice brevibus, tibiis haud latis, anticis extus obtuse dentatis, posticis 4 sat fortiter spinosis, tarsis sat brevibus; capite leviter transversim strigoso, antice profunde emarginato et utrinque paulo producto; pronoto minute haud parce punctato, lateribus fere rugosis, marginibus lateralibus postice rectis, fere parallelis, antice leviter curvatis et convergentibus, angulis omnibus paulo rotundatis; elytris striatis, striis haud punctatis, interstitiis minutissime et parcissime punctulatis, lateribus sat fortiter seriato-punctatis.

Long. 5·5–6·5 mm.; lat. 2·5 mm.

Solomon Is.: Guadalcanal, Mamawa (*Capt. R. J. A. Lever*, November).

Three specimens were found by Capt. Lever in rotten wood.

P. leveri differs from the four species of the genus already known in having the tibiæ of normal form and not distinctly dilated, the front tibia bearing three or four blunt lateral teeth placed far apart and the middle and hind tibiæ having each a rather strong spine beyond the middle preceded by a few very minute ones. The head is not rounded at the sides, but straight, with its front margin deeply excised in the middle and produced on each side beyond the mandibles. The eyes are rather large, and the head bears a few lightly impressed undulating scratches between them and in the anterior part. The hind angles are not very sharp. The pronotum is finely but distinctly punctured, except at the sides, where it is rather feebly rugose. The elytra are deeply striate dorsally, without punctures in the striæ, and each bears four rows of fairly large punctures at the side.

The tarsi are narrower than in the other species but do not differ otherwise, the claws being invisible and the front tarsi alone showing division.

The original description and figures of the genus *Penichrolucanus* are not entirely accurate, especially in regard to the antenna, the characteristic Lucanid form of which they fail to represent. The scape is not very short, as stated, but, as in Lucanidæ generally, very long. It is, in fact, about half the length of the whole organ, but it is received, in the position of rest, within a deep cavity between the eye and the gula and partly concealed by an angular projection of the submentum. The antenna has the elbowed form distinctive of this family and, with the exception of the globular second joint connecting scape and funicle, it has evidently very little flexibility. Although the full number of ten joints is traceable in *P. leveri*, the five composing the funicle are completely united into a short solid cone, which is itself immovably united with the first of the three very large club-joints.

EXPLANATION OF PLATE IV.

Fig. 1. *Figulus cheesmani*, sp. n., enlarged.
Fig. 2. —— *serratus*, sp. n., enlarged.
Fig. 3. —— *concatenatus*, sp. n., enlarged.
Fig. 4. —— *aratus* Arrow, enlarged.
Fig. 5. *Dorcus ursulus*, sp. n., natural size.
Fig. 6. —— *velutinus* Thoms., natural size.
Fig. 7. —— *verrucatus*, sp. n., enlarged.
Fig. 8. —— *immundus*, sp. n., natural size.
Fig. 9. —— *rugosus* Boil., natural size.
Fig. 10. *Penichrolucanus leveri*, sp. n., enlarged.

VI.—*On* Barbus wöhlerti, *sp. n., the "Zwergsichel-Barbe" of German Aquarists.* By ETHELWYN TREWAVAS, D.Sc., Assistant Keeper in the British Museum (Natural History).

IN the 'Wochenschrift für Aquarien- und Terrarienkunde' of December 1936 there appeared an article by Mr. Paul Wöhlert of Hamburg on a small, unidentified fish, imported alive, probably from Portuguese East Africa. The account was illustrated by a photograph which showed three small, living, *Barbus*-like fish remarkable for the size and shape of the anal fin, which feature suggested to Mr. Wöhlert the German name "Zwergsichel-Barbe." In March 1937 a specimen of this fish was sent to the British Museum (Nat. Hist.) for identification by Mr. Rachow of the Fish-determination Bureau at Hamburg. The specimen, however, was not well preserved, and although my colleague, Mr. Norman, believed it to be a new species, he did not venture to describe it on such imperfect material. In February of this year Mr. Wöhlert sent a well-preserved specimen which it falls to my lot to describe. I have pleasure in naming this new species in honour of Mr. Wöhlert, and at the same time of recording my gratitude to him and to Mr. Rachow for presenting the specimens to the British Museum (Nat. Hist.).

There seems to be no reason for separating the new species from the genus *Barbus*, within which it falls in the section in which the scales have few, radiating striæ, the dorsal fin has no rigid ray, and barbels and lateral line are absent.

I am unwilling to use subgeneric names for *Barbus*, at least for the African species, in the present state of our knowledge of the genus.

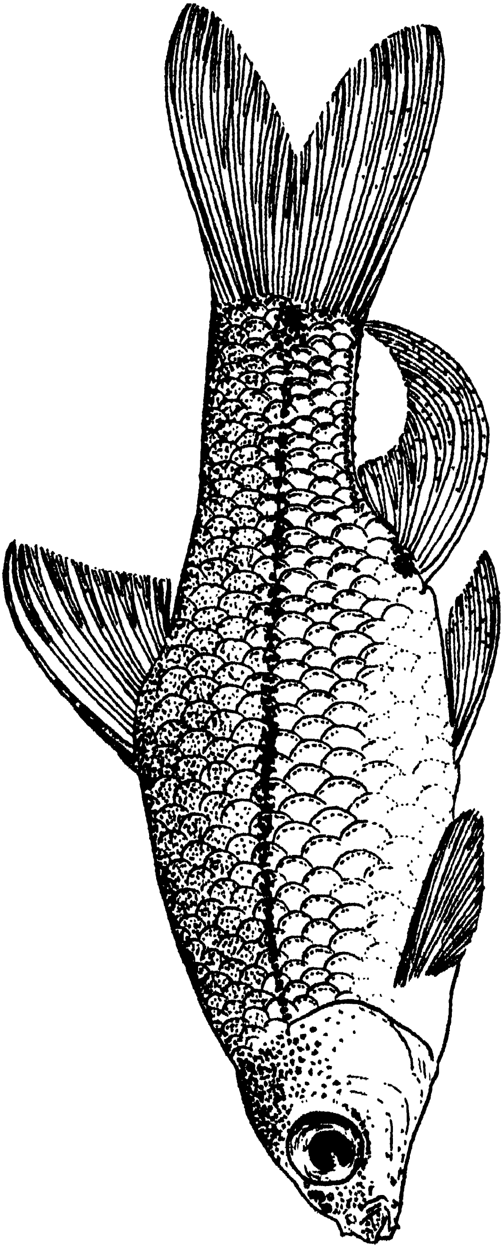
Barbus wöhlerti, sp. n.

"Zwergsichel-Barbe" of P. Wöhlert, Wschr. Aqu. u. Terrarienk. lii. 1936, pp. 819–820, fig. 2.

Depth of body nearly 3 in the length, length of head 3⅔. Snout a little shorter than diameter of eye, which is 3⅓ in length of head. Interorbital width 2¾ in length of head. Mouth small, terminal, without barbels; lower lip-fold well developed, interrupted at the symphysis. No lateral line. 32 scales in a longitudinal series, 11 in a transverse series immediately in front of dorsal fin. Dorsal III 8; last simple ray flexible, not enlarged. Base of dorsal equidistant from caudal and posterior edge of eye, its origin very slightly behind that of pelvic. Anal III 5. Pectoral ¾ length of head, not extending to pelvic.

A dark spot at base of caudal and a black band extending forwards from this to head. Upper part of body lightly pigmented, lower part semitranslucent; lateral scales outlined in black, with a pigment band parallel to the margin. A dark spot near origin of anal and a narrow dark band along ventral edge of caudal peduncle. Anterior edges of dorsal, anal, and pectoral fins dark.

Secondary Sexual Characters.—The type is presumably a male. In it the anterior rays of the anal fin are somewhat broadened and are produced to form a sickle-shaped lobe extending to the level of the caudal fin. There is a series of four pointed tubercles across the snout, a median tubercle on the chin, and others, rather smaller, near the nostrils, on the preorbital and below the eye, and also along the lower jaw, interoperculum, and edge of operculum. Small spinules are also found on the upper surfaces of the pelvics, on the anal fin, on the ventral part of the



Barbus wöhlerti, sp. n., type. × 5¼.

caudal peduncle, and (a few) on the lower lobe of the caudal and even (few and minute) on the dorsal fin.

Described from a single specimen, the type, 23+3 mm. long to end of middle caudal rays, presented by Mr. Paul Wöhlert of Hamburg to the British Museum (Natural History), and believed to have come from Mozambique and to have been shipped from Zanzibar.

In life the lateral band is described as red-violet, the ventral streak of the caudal peduncle as blackish-brown, and the fins as colourless except for the dark anterior edges of dorsal and anal (Wöhlert, *l. c.*). Mr. Wöhlert informs me that he has seen females, and that in them the anal fin is not produced. Doubtless they are also without spinules.

Another male, 21+3 mm. long, sent to the British Museum (Nat. Hist.) by Mr. Rachow, agrees with the type in numerical characters. The anal fin is produced and sickle-shaped, but no tubercles can be seen. This may be due to poor preservation, but more probably the tubercles appear only at the breeding season.

B. wöhlerti is distinguished from all other African species and from all other *Barbus*, as far as the writer can discover, by the sickle-shaped anal fin of the male. It has accordingly been considered safe to describe it in spite of the paucity of the material and the vague information concerning locality. Of the African species with flexible third dorsal ray and without lateral line or barbels, it most resembles *B. toppini* Boulenger, 1916. Among the specimens (syntypes) of *B. toppini* in the British Museum is one in which the top of the head and the preorbital bone are covered with minute spinules. Horny spinules are found on the head also in the African species *B. asper* Boulenger, 1911, *B. senticeps* J. L. B. Smith, 1936 (species with a single pair of barbels), *B. burchelli* A. Smith, 1840, and *B. vulneratus* Castelnau, 1861 (which have two pairs of barbels when full-grown *). In these four species the lateral line is complete or nearly so.

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* Barnard (*infra*, pp. 82, 83. I have been privileged to see the MS.) finds that development of barbels may be delayed in some species. Mr. Wöhlert kept specimens of the Sickle-Barbus alive and healthy for several months without observing any growth; it is therefore probable that the type is full-grown and that barbels are never developed.

VII.—*Some new Termitophilous Spiders from Brazil.*

By W. S. Bristowe, M.A., Sc.D.

In the course of a visit to Brazil in 1923 I collected a number of invertebrates from the galleries of termite nests (*). The new species of beetles and wingless Phorid flies have been described by Dr. A. Reichensperger and Dr. T. Borgmeier respectively. In the present paper I describe six species of spider. Five belong to the family Oonopidæ and one to the Theridiidæ. Five are new to science and the sixth unknown in the male sex. One requires a new genus for its reception.

These spiders were, so far as I could determine, living in the galleries inhabited by the termites. Many other spiders distributed between no fewer than eight different families were collected from the termite mounds, but these, I believe, were not truly termitophilous in that they inhabited only the disused outer portions of the mounds.

The industry of Mello-Leitão has thrown much light on the spider fauna of Brazil, but the Oonopids are either poorly represented or else have mainly escaped attention. Hence the discovery of four new species is of some interest.

The little Theridiid male has a most remarkable appearance with a cephalothorax reminiscent of some strange prehistoric monster. Since it does not fit satisfactorily into any known genus I have formed a new one for its reception (*Brontosauriella*).

Family **Oonopidæ**.

1. *Dysderina termitophila*, sp. n. (Figs. 1–3.)

Length.—About 3 mm.

Cephalothorax.—Convex, shining, and clothed with few hairs. Provided with four large stout teeth almost identical with those found in *Xyphinus hystrix* Sim. and figured by Simon (Hist. Nat. des Araignées, i. p. 288). One pair in a lateral position on the posterior border; the other more central and near the posterior border. In addition there are blunt chitinous knobs along the border near the posterior end.

Pedicel.—Somewhat long. Posterior portion granular laterally.

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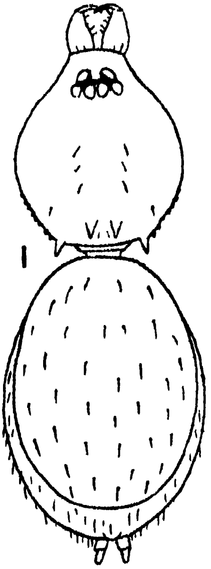
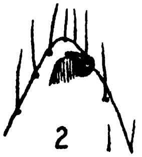
* W. S. Bristowe, Trans. Ent. Soc. Lond. (1925).

Eyes.—Six, differing little in size. Anterior pair separated by nearly the diameter of one of them. Posterior pairs contiguous and in a straight line.

Legs.—Ventral spines of tibia i., 4—5; metatarsus i., 2—3; tarsus, patella, and femur, nil.

Sternum.—Border notched opposite coxæ with shallow troughs extending inwards from these notches. Extends between posterior coxæ. Posterior margin concave. Scantily clothed with stiff bristles.





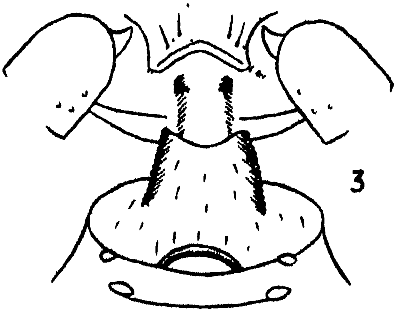


Fig. 1.—Dorsal surface of the female with legs removed.
Fig. 2.—Tip of male palp, showing palpal organ.
Fig. 3.—Posterior portion of the sternum and anterior portion of the female's abdomen.

Abdomen.—Provided with extensive scutum above and below. Latter extends considerably more than half way to spinnerets.

Colulus.—In this and some other Oonopids I have detected a minute protuberance usually bearing two hairs which must, I think, be regarded as a colulus.

Colour.—Cephalothorax, sternum, legs, and abdominal scuta dark reddish-brown.

All the above characters apply equally to the male. The palpal organ is almost entirely enclosed inside the tarsus.

Material.—One female and two males collected from the nests of *Eutermes arenarius* at Santa Catharina, Brazil, in 1923.

2. *Dysderina rugosa*, sp. n.

This species differs from the last in having no cephalic teeth or tubercular border, in the surface of the cephalothorax being covered with granulations or minute tubercles, in the ventral scutum extending closer to the spinnerets, in its somewhat larger size (about 4 mm.), and in its leg armature. In its armature it also differs from *D. keyserlingi* Sim., the only other member of the genus recorded from Brazil. Tibia i., 5—5; metatarsus i., 3—3; tarsus, patella, and femur, nil. In other respects it is very similar to *D. termitophila*—in its pedicel, eyes, shape of sternum, and colour.

Material.—One female collected from the nest of *Capritermes opacus* in Brazil in 1923.

3. *Gamasomorpha brasiliana*, sp. n. (Fig. 4.)

Length.—About 2 mm.

Cephalothorax.—Cephalic region smooth and shining; thoracic region granular or covered with minute tubercles.

Eyes.—Six, compact and differing little in size. Anterior eyes barely a diameter apart. Median eyes touching these and laterals. Posterior row of four eyes recurved.

Maxillæ.—Inclined inwards, but not touching in front of the labium.

Legs.—No spines, or at least none in series. Patellæ of average length.

Sternum.—Clothed scantily with short hairs. Posterior border convex, but not extending between posterior coxæ.

Abdomen.—Dorsal and ventral scuta extend almost to the spinnerets. Minute colulus bearing two hairs present in this spider also.

Vulva.—Characteristic appearance. A darkened U with a little notched chitinous prominence anterior to this bordering the epigastric furrow.

Colour.—Reddish yellow.

Material.—Two females from nests of *Eutermes arenarius* collected at Santa Catharina, Brazil, in 1923.

4. *Oonops leitaoni*, sp. n. (Fig. 5.)

Length.—About 2 mm.

Eyes.—Anterior pair separated by nearly the diameter of one of them. Posterior row recurved.

Colour.—Pale pink cephalothorax and pale yellowish abdomen.

Abdomen.—Scantily clothed with fine hair.

Fig. 4.

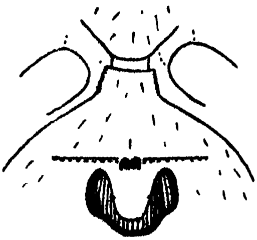


Fig. 5.

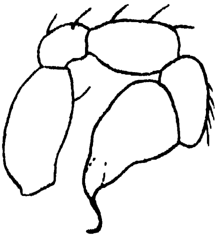


Fig. 4.—*Gamasomorpha brasiliana*, sp. n. Anterior portion of the female's abdomen (ventral surface).
Fig. 5.—*Oonops leitaoni*, sp. n. Male palpus.

Sternum.—Only slightly attenuated posteriorly.

Legs.—Tibia i., 5–5 spines; metatarsus, 3–3; femur with two spines on the inner side.

Palp.—Stout femur and tibia. Extensive bulb with long hook-shaped style.

Material.—One male collected in 1923 from nest of *Eutermes arenarius* at Santa Catharina, Brazil.

5. *Oonops acanthopus* Sim. ? (Figs. 6, 7.)

In 1907 Simon described this species from a female collected in Brazil (Ann. Soc. Ent. Belg. viii. 1907, p. 252). His description is brief and unaccompanied by figures, but I nevertheless think it probable that a male which I collected from the nest of a Brazilian termite, *Eutermes arenarius*, can be attributed to the same species. It agrees in size, eye arrangement, leg armature, and in the shape of the cephalothorax. My specimen is 3 mm. Spines are as follows:—Tibia i., 5—5; metatarsus i., 4—4; femur i., two spines on the inside. The posterior eyes (seen from above) are recurved and the median pair are the largest. The anterior pair are separated by nearly the diameter of one of them. The cephalothorax is very high, sloping away steeply behind.

The legs are longer than is usual for the genus.

The palpal style is narrow, curved, and twisting round the conductor.

Fig. 6.

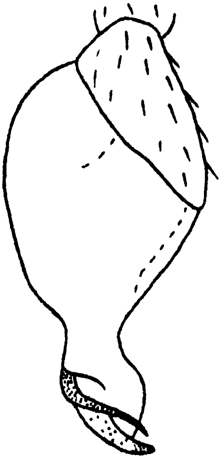
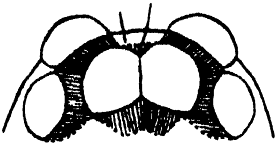


Fig. 7.



Oonops acanthopus Sim.

Fig. 6.—Male palpus.
Fig. 7.—Eyes (from above).

Family **Theridiidæ.**

BRONTOSAURIELLA, gen. nov. (based on the male).

Cephalothorax.—No fovea or striæ. Anterior portion, in the male, extending into a prominence bearing one pair of eyes.

Eight eyes. Anterior pair slightly the largest; remainder approximately equal. Lateral eyes contiguous. All eyes on dark patches.

Cheliceræ.—Fangs fine. In the male the superior margin provided with a sharp-edged keel and the inner margin with one tooth.

Sternum.—Length and breadth approximately equal. Anterior prolongation to the labium. Sides indented opposite coxæ. Posterior margin prolonged between coxæ.

Abdomen.—Spiracle close to the spinnerets. No scutum.

Palpus.—Short. No tibial apophysis in the male. Tibia and patella of about equal length. Organ simple.

Legs.—Spineless except metatarsus i., which has several long stout bristles or fine spines ventrally, not arranged in series. Tarsus iv. bears stout bristles in a series typical of the Theridiidæ. First pair of legs longer and stouter, especially femurs, than the other legs. Metatarsi of all legs much longer than the tarsi, but not so long as the tibiæ. Tarsi not abnormally short (as in *Moneta*) nor appreciably finer than the metatarsi.

Tarsal claws lack teeth.

Fig. 9.

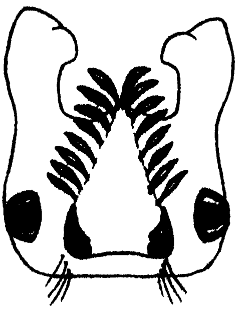
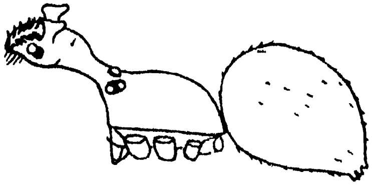


Fig. 8.



Brontosauriella melloleitaoni, sp. n.

Fig. 8.– Male from the side (with legs removed).
Fig. 9.—Anterior portion of the male's cephalic prominence viewed from in front.

6. *Brontosauriella melloleitaoni*, sp. n. (Figs. 8–13.)

Length.—About 3 mm.

Colour.—Cephalothorax, legs, and sternum, light reddish brown; abdomen of spirit specimen pale cream and scantily clothed with short pale hairs.

Cephalothorax.—Extended forwards into an extensive prominence (see fig. 8). On each side of this is an eye. The remaining eyes are grouped at the front margin of the main portion of the cepahlothorax. The two lateral pairs share the same black patch and are contiguous. Between the anterior pair, which are situated near the apex of the prominence, are two rows of about eight flattened lanceolate spines which converge as they pass upwards towards the summit of the prominence. Two black spots at the apex enhance the resemblance of this prominence to the head of some vertebrate animal by their likeness to nostrils. Two flattened processes which rise from near the top of this " head " resemble ears.

Cheliceræ.—The margin is not slanting and bears on its superior margin a sharp-edged keel with an appearance from in front of one large sharp tooth and a blunt prominence. The inner margin bears one tooth.

Palpus.—The organ is simple with a short blunt style.

Fig. 10.

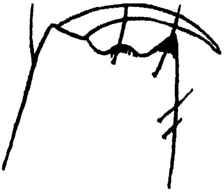


Fig. 11.

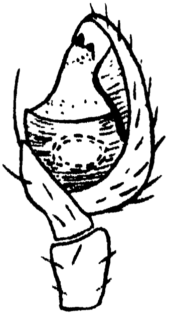


Fig. 12.

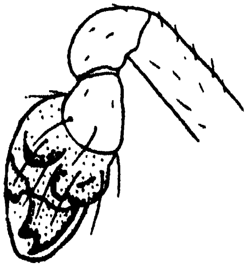
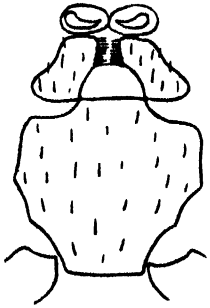


Fig. 13.



Brontosauriella melloleitaoni, sp. n.

Fig. 10.—Chelicera.
Figs. 11, 12.—Male palp from two angles.
Fig. 13.—Sternum and maxillæ.

Sternum.—Slightly convex, shining, and scantily clothed with short hairs.

Material.—One male from a nest of *Eutermes arenarius* at Santa Catharina, Brazil.

VIII.—*Importance of Colour-pattern in the Phylogeny of certain Barbets.* By J. D. Macdonald, B.Sc., Department of Zoology, British Museum (Natural History).

There is a remarkable similarity in colour and colour-pattern between those barbets now commonly known as *Pogonorhynchus dubius* (Gm.), *Erythrobucco rolleti* (Defil.), and *Lybius bidentatus* (Shaw). These barbets had always been kept in one genus, eventually *Pogonorhynchus*, until Shelley, in a short note ('The Ibis,' 1889, p. 475), separated the three genera on what seems to be relatively unimportant evidence. Shelley's arrangement

Fig. 1.

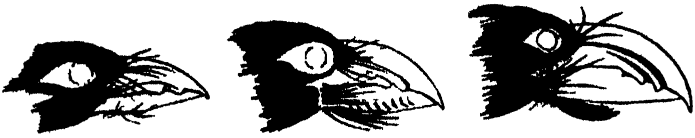
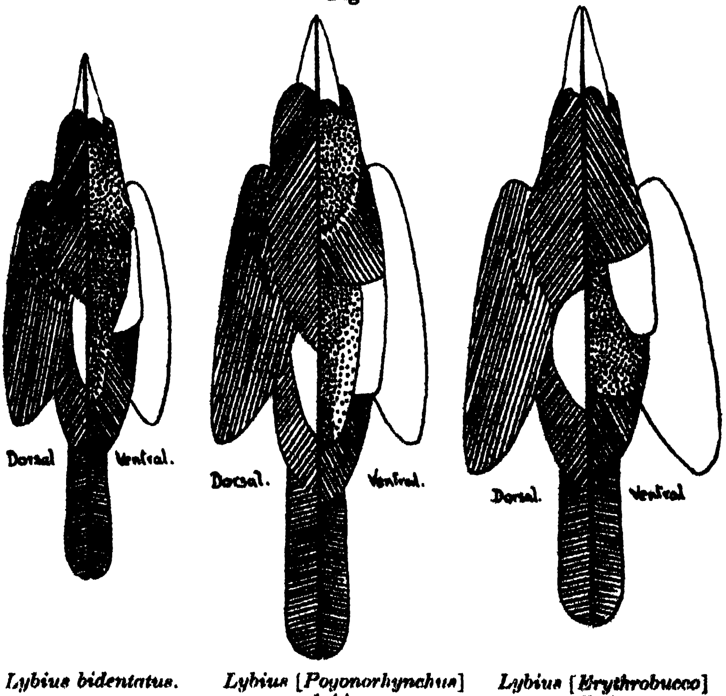


Fig. 2.



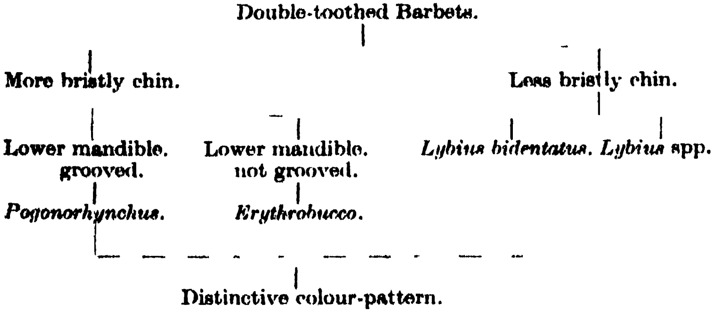
Lybius bidentatus. *Lybius* [*Pogonorhynchus*] *dubius.* *Lybius* [*Erythrobucco*] *rolleti.*

Fig 1.—Side view of head, × ½.
Fig. 2.—Diagrammatic representation of colour and colour-pattern on the dorsal and ventral sides. × ½. Lined = blue-black; stippled = red; blank = white (except under wings).

was adopted apparently without question, even against the authority of such an excellent systematic work as Marshall's 'Monograph of the Capitonidæ,' 1871. The similarity between these species has often been remarked upon, yet nobody seems to have wondered why such a striking resemblance should be found between three species in three different genera in a group in which such likenesses, even between species in the same genus, are very uncommon. It is desirable that the taxonomic value of the characters on which Shelley bases his genera should be reconsidered.

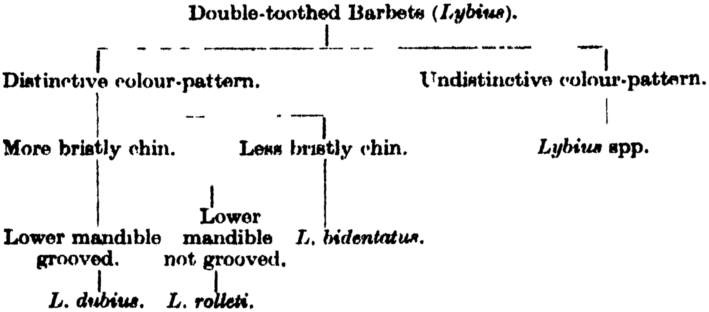
Pogonorhynchus and *Erythrobucco* are monotypic genera; *Lybius* is composed of several species. The three genera have a common character in the double-toothed upper mandible. The greater number of bristles on the chin separates *Pogonorhynchus* and *Erythrobucco* from *Lybius*, and the grooved lower mandible *Pogonorhynchus* from *Erythrobucco* (see fig. 1). These might be adequate reasons for generic distinction, were it not for the striking uniformity in colour and colour-pattern between *Pogonorhynchus*, *Erythrobucco*, and *Lybius bidentatus* (see fig. 2).

The above paragraph may be summarized as follows:—



There has been a general tendency among zoologists as a whole to regard characters of colour as being of less importance than characters of structure. Though as a general rule this may be true, I feel that the former ought to be given due consideration, especially when one distinguishes between colour, which in the majority of instances has a chemical basis, and colour-pattern, which in a last resort may be said to be structural.

In attempting to assess the phylogenetic value of various characters it may be taken as a general rule that the more constant one particular character is throughout wide ranges of variation in others then the more deep-seated is its significance. The greatest difficulties, perhaps, lie in selecting the characters to which attention is to be given, and particularly in realizing that their relative importance may vary from group to group. When this principle is applied to the birds under discussion the result is as follows :—


Double-toothed Barbets (*Lybius*).
Distinctive colour-pattern.
Undistinctive colour-pattern.
More bristly chin.
Less bristly chin.
Lybius spp.
Lower mandible grooved.
Lower mandible not grooved.
L. bidentatus.
L. dubius.
L. rolleti.

The conclusion is that in this instance the uniformity in colour and colour-pattern is of greater significance than the quantity of bristles on the chin or the grooving of the lower mandible.

It must be pointed out that, as a matter of practice, the status of " genus " in any group is largely a matter of numerical convenience and stands for no constant degree of affinity. In the above arrangement it is impossible to give value to all the degrees of relationship indicated. One can only choose a suitable stage at which to define the genus, and in this instance that in which the character of the bill is considered gives a workable group of only sixteen species and is also of comparative value in regard to other genera of barbets.

It is recommended, therefore, that the three species be kept in the same genus, with the following synonymy :—

Genus Lybius Hermann.

Barbets in which the upper mandible is clearly double-toothed.

Lybius Hermann, Tab. Affin. Anim. pp. 217 & 235 (1783).
Pogonorhynchus van der Hoeven, Handb. Dierk. 1st ed. ii. p. 446 (1833).
Erythrobucco Shelley, Ibis, 1889, p. 475.

IX.—*A new Fish of the Genus* Selenotoca.

By A. Fraser-Brunner.

Recently, in an aquarium journal, I drew attention to the fact that a Chætodont fish of the subfamily Scatophaginæ, which has been imported on several occasions for the aquarium under the name *Scatophagus* *multifasciatus*, is not that species, but another, new to science. It has been pointed out to me, however, that the paper in question may not be generally available to ichthyologists, and it seems advisable, therefore, to repeat my account of the fish here.

The species described by Richardson (1844) as *Scatophagus multifasciatus* has lately been shown by Myers* to represent a distinct genus, *Selenotoca*, which differs from *Scatophagus* as follows:—

Free margin of preorbital bone continuous with that of suborbital as a nearly straight line. Gill-membranes forming a free fold across the isthmus. Scales very small. Dorsal spines 11. Dermal part of pelvis broad and flat	*Scatophagus.*
Free margin of preorbital bone making a distinct angle with that of suborbital, which is very narrow. No free fold across the isthmus. Scales minute, almost invisible. Dorsal spines 12. Dermal part of pelvis narrow, grooved	*Selenotoca.*

The genus *Scatophagus* contains *S. argus* of the Indo-Pacific and the East African *S. tetracanthus*, besides several nominal forms which may or may not prove to be distinct.

Selenotoca is represented by two species, *S. multifasciata* Richardson and that described below as new. The following key shows the main differences between them:—

Third dorsal spine considerably the longest. Depth of body contained 1¾ times in the length. Distance from tip of snout to vertical from origin of dorsal fin contained 2⅗ to 2⅘ times in length of body. Caudal fin truncate or emarginate. Principal transverse dark bars 10–12 in number, ¼ diameter of eye at widest part...............	1. *multifasciata.*
Fourth dorsal spine the longest. Depth of body contained 2 times in the length. Distance from tip of snout to vertical from origin of dorsal fin contained 2⅕ to 2⅜ times in length of body. Caudal fin rounded. Principal transverse dark bars 7 to 8 in number, ⅕ diameter of eye at widest part ..	2. *papuensis.*

The above comparisons were made between specimens of the same size. The differences are clearly recognizable between specimens as small as 45 mm. long. *S. multifasciata* nearly always has shorter and less distinct bars between the principal ones, but these do not appear to be developed in *S. papuensis*. In *S. multifasciata*, too, the anterior rays of the soft dorsal and anal fins are slightly elevated and the margins of the fins may become concave in old examples; but in *S. papuensis* these fins are evenly rounded, with none of the rays elevated. The interorbital space is always wider than the eye in *S. papuensis*, whereas in *S. multifasciata* it is narrower than the eye in young specimens.

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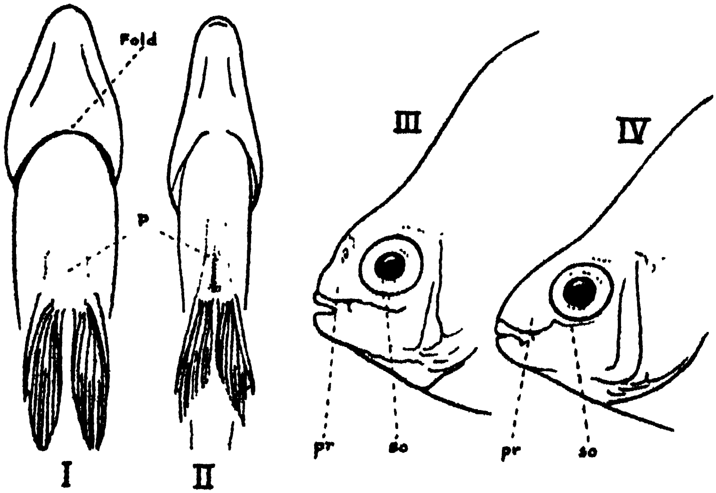
* Proc. Biol. Soc. Washington, vol. xlix. 1936, pp. 83–86.

Fig. 1.



I, ventral view; III, side view of head of *Scatophagus*. II, ventral view; IV, side view of head of *Selenotoca*. *pr*, preorbital; *so*, suborbital; *p*, pelvis.

Selenotoca papuensis, sp. n.

Scatophagus tetracanthus (part) Fowler and Bean, 1929, Bull. U.S. Nat. Mus. no. 100, vol. viii. pp. 34, 40; Innes, 1933, The Aquarium, vol. i. no. 11, p. 301, fig.; 1935, Exotic Aquarium Fishes, 1st ed. p. 424, fig.

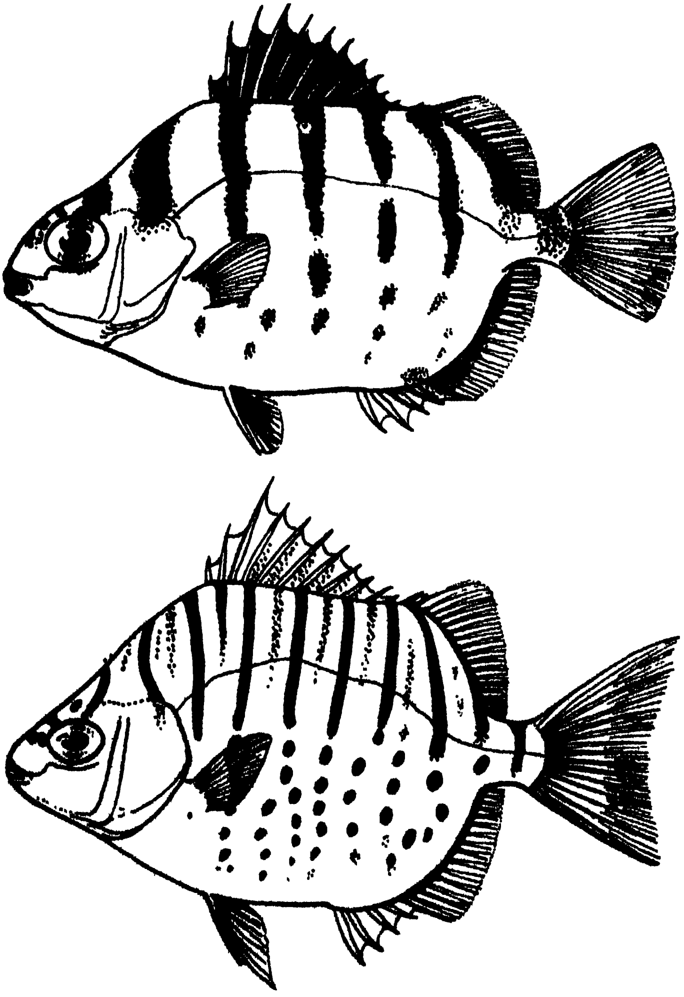
Scatophagus multifasciatus Innes, 1935, Exotic Aquarium Fishes, 2nd ed. p. 428, fig.

Selenotoca papuensis Fraser-Brunner, 1938, The Aquarist, vol. viii. no. 3, p. 75, fig. 3.

Depth of body contained twice in the length, length of head 3 times. Diameter of eye contained 3 times in length of head, less than interorbital width. Distance from tip of snout to vertical from origin of spinous dorsal contained 2⅛ to 2⅜ times in length of body.

Free margin of preorbital forming a distinct angle with that of suborbital. Gill-membranes not forming a fold across isthmus. Scales minute, almost invisible. Dorsal fin with 12 spines, the fourth the longest; soft rays 16. Anal fin with 4 spines and 16 rays. Pectoral rays 16. Pelvics each with 1 spine and 5 soft rays, the first ray scarcely longer than the spine. Caudal fin broadly rounded.

Fig. 2.



Above, *Selenotoca papuensis*, sp. n. Holotype (× ½). (Richardson, 1844.) Below, *S. multifasciata*.

Silvery, with three narrow black bars across interorbital space; a broader bar from tip of head through eye, followed by six or seven others, each of which breaks up into spots on lower half of side; the first from nape to operculum, second from origin of dorsal to pectoral, third and fourth below spinous dorsal, fifth and sixth below soft dorsal, seventh across caudal peduncle. Lips, membrane of spinous dorsal, base of soft dorsal and anal, and a patch on pelvics black.

Hab. New Guinea; Celebes.

The type is a specimen 90 mm. long from New Guinea, in the British Museum (Natural History).

This fish was imported for the aquarium first under the name *Scatophagus tetracanthus*, which was later found to be incorrect and altered to *S. multifasciatus*. Although a small example in the British Museum received from Dr. Arnold is labelled "Brisbane (?)," it seems unlikely that this form occurs on the Australian coast, except perhaps at Cape York. The specimen in question was an aquarium fish, and the exact locality from which such individuals are taken is often difficult to ascertain.

S. multifasciata, on the other hand, occurs with practically no variation on the north, west, and east coasts of the Australian continent.

X.—*Notes on the Species of* Barbus *from the Cape Province, with Descriptions of new Species.* By K. H. Barnard, D.Sc., F.L.S., South African Museum.

The investigation of the river fishes of the S.W. Cape Province has disclosed several errors in the monographs of Boulenger ('Freshwater Fishes Africa,' 1909–1916) and Gilchrist & Thompson (Ann. S. Afr. Mus. xi. 1913 & 1917). Attention has been drawn to one of these (Barnard, Ann. & Mag. Nat. Hist. (10) xix. p. 304 (1937)); and it is considered desirable to publish the following notes on synonymy and brief descriptions of the new species to avoid further misconceptions of the species, and in order that the revised names may be utilized in reports issued by the Inland Fisheries Advisory Officer of the Cape Provincial Administration. Full reasons for the synonymy here adopted will be given in a future paper, together with the life-histories and biology of the species concerned.

It may, however, be stated that the cause of some of the misconceptions was the failure or inability of Boulenger to examine certain type-specimens. I would like to express my great obligations to Prof. de Beaufort of the Amsterdam Museum and Dr. E. Ahl of the Berlin Museum for entrusting to me the types and other material under their charge in the respective museums. My thanks are also due to Dr. E. Trewavas of the British Museum for information on several of the specimens recorded by Boulenger.

No opinion is expressed on the identity of specimens from the Transvaal, Natal, or elsewhere, recorded as belonging to species known to inhabit the S.W. Cape, except to suggest that further investigation based on abundant material is needed before accepting these records. The present investigation (of the western half of the Cape Province only) has already shown that the species are restricted to their respective river-systems to a much greater extent than has hitherto been suspected. The occurrence of *asper* in Lake Tanganyika, or even of *burchelli* in Natal, is scarcely credible on the evidence, biological and topographical, which is accumulating.

Importance is attached to the presence of bright red splashes at the bases of the dorsal, anal, pectoral, and ventral fins (not a general pinkish or salmon suffusion of the whole fin) in certain medium and small-sized species known as "Red-fins." It is unfortunate that this is a fleeting and not a permanent (morphological) character; but the colours of preserved specimens given in so many descriptions are, in the main, equally useless for purposes of identification.

In some species, but not all, the length of the pectoral fin is a sexual, not a specific, character, the fin reaching to or almost to the ventral in the ♂, but being distinctly shorter in the ♀.

Further, the identification of, and *a fortiori* the description of new species based on single specimens, without a long series showing growth changes, is liable to cause many errors (*cf.* Pappenheim in Schultze's Reise, iv. p. 277, 1910).

Barbus holubi Stndr.

The young specimens recorded by Weber (1897) from Viol's Drift, Orange River, as *capensis* have been seen by me and prove to be the young of *holubi*.

The validity of *kimberleyensis* G. & T. (1913) is very doubtful.

Orange River system.

Barbus capensis A. Smith.

See Barnard, *l. c.* p. 305, 1937. Not *capensis* Weber, 1897, Pappemheim 1910, Boulenger 1911 (except A. Smith's type-specimen), Gilchrist and Thompson 1913, nor J. L. B. Smith 1937 ('Guide to Vertebrate Fauna of Eastern Cape Province,' pt. 2, p. 125).

A form with enlarged, fleshy lips, the median portions forming lobes, occurs with the normal form (*cf.* Worthington, Proc. Zool. Soc. London, 1929, p. 431, fig. 3).

Olifants River system, Clanwilliam, Cape.

Barbus serra Peters.

I have seen the type ex Berlin Museum. A distinctive species The insertion of the word "Transvaal" in Gilchrist and Thompson's record is regarded as a slip.

Olifants River system, Clanwilliam, Cape.

Barbus andrewi Brnrd.

Barnard, *l. c.* p. 305, 1937. The young specimens (seen by me) from French Hoek and Paarl recorded as *capensis* by Weber (1897) belong here.

In large specimens the serrations on the dorsal spine may become feeble or obsolete; occasional aberrations occur in which the spine is very slender, flexible, and nonserrate. Such specimens, if taken by themselves, would probably be described as a "sp. n."

The only species, apparently, which inhabits two distinct and diametrically opposed river systems in the area examined.

Berg River and Breede River systems.

Barbus burchelli A. Smith.

Weber's juveniles from French Hoek (seen by me) recorded as *anoplus* belong here; but not his Oudtshoorn and Laingsburg specimens recorded as *burchellii*. Boulenger's *burgi* is merely the ♂; and the 'Challenger' specimen recorded by him as *afer* is also *burchelli*, as it has *two* pairs of barbels (information supplied by Mr. J. R. Norman of the British Museum). Probably not Fowler (1934), nor J. L. B. Smith (1937, *l. c.* p. 127).

Red-fin. Conical warts on head in ♂. Anterior pair of barbels developed at a length of 52 mm. (specimens under this length thus liable to be confused with *asper*, *anoplus*, etc.). Caudal peduncle scales 12, predorsal 13–15. Radiate striæ on scales up to 16 (according to age). Pectoral shorter in ♀ than in ♂.

Eerste and Berg Rivers. Although separate rivers these two are not diametrically opposed as are the Berg and Breede Rivers, but both flow across the Post-Tertiary marine-cut terrace on the *western* coast.

Barbus vulneratus Cast.

Part only (Zonder Einde R.) of the specimens recorded by Boulenger (1911), and none of those recorded by Gilchrist & Thompson, belong to this species. Its presence in the Baakens and Zwartkops Rivers needs confirmation. Steindachner's type of *multimaculatus* I have not seen.

Red-fin. Warts on head in ♂. Anterior pair of barbels developing at a length of 21 mm., and always better developed than in *burchelli*. Caudal peduncle scales 14 (12 in juv. only), predorsal 17 18. Radiate striæ on scales up to 10. Lat. line tubules inconstant posteriorly. Pectoral shorter in ♀ than in ♂.

Breede River system (incl. its tributary the River Zonder End), also the Nieuwejaar, Grashoek, and Kars Rivers (Elim-Bredasdorp District), the Duivenhoks R. (Heidelberg, Cape), and Kaffirkuils R. (Riversdale). All these latter rivers were probably connected in former times with the Breede River system as extended across the now submerged Agulhas Bank. Entirely absent from the Gouritz River system ; hence the doubt of its occurrence in any system still farther east.

Barbus pallidus A. Smith.

This and *hemipleurogramma* Blgr. are the only species in the Cape with two pairs of barbels and so few and such large scales (Andrew Smith remarked on the large size of the scales). In the absence of the type-specimen Boulenger was probably too cautious to resuscitate Smith's species, but he certainly failed to notice the resemblance between *pallidus* and his own new species. They are obviously the same species, but full reasons for the suppression of *hemipleurogramma* will be given in a later paper.

No red-fins. No warts on head in ♂. Lat. line 27–29, caudal peduncle 12, predorsal 11 ; radiate striæ 6–8, Lat. line complete or variably inconstant. Pectoral shorter in ♀ than in ♂.

Baakens and Zwartkops Rivers, Port Elizabeth.

Barbus asper Blgr.

Weber's Buffels R. and Kamenassie R. specimens (seen by me) recorded as *burchellii*, Boulenger's nos. 1–10 Grobelaars R., Oudtshoorn, specimens recorded as *anoplus*, and Gilchrist and Thompson's Grobelaars R. specimens also recorded as *anoplus*, all belong to this species. Borodin's record from Lake Tanganyika (Zool. Jahrb. Abt. Syst. lxviii. p. 6, 1936) seems an extraordinary identification.

Red-fin. Warts on head in ♂. Mouth terminal or subterminal. One pair of barbels developing at a length of 28 mm. Lat. line 35–41, caudal peduncle 16–18 (20 in old examples), predorsal 19–25, radiate striæ comparatively few 12 (–14). Lat. line tubules inconstant posteriorly. Pectoral shorter in ♀ than in ♂.

Gouritz River system and Groote-Gamtoos River system. Possibly also the Port Elizabeth area.

Barbus senticeps J. L. B. Smith.

Boulenger's no. 18 as *anoplus*, and Gilchrist and Thompson's three specimens from Baakens River as *vulneratus* belong here. Boulenger's no. 18 is probably, so Dr. Trewavas informs me, the specimen chosen to illustrate what Boulenger thought was *anoplus* (fig. 155); consequently G. & T.'s figure 87 applies also, but not the description nor the recorded specimens.

Red-fin. Warts on head in ♂. Mouth subterminal. One pair of barbels. Lat. line 30–32, caudal peduncle 12, predorsal 14, radiate striæ few 10–12. Pectoral shorter in ♀ than in ♂.

Kromme R., Baakens R., and Zwartkops R., all probably in former times interconnected and part of the Gamtoos system. Probably occurs also in the Gamtoos.

Barbus anoplus Weber.

Owing to his not (apparently) having examined the types, Boulenger entirely misconceived this species; and, consequently, Gilchrist and Thompson did likewise. All their records are erroneous; how many other records (Fowler 1934, 1935; J. L. B. Smith 1937) are also wrong is impossible to say, but I believe that not one of these authors saw a true *anoplus*.

For the opportunity of examining Weber's types I have to thank Dr. de Beaufort. Only Weber's Buffels R., Laingsburg, specimens are to be regarded as the type series; his French Hoek specimens are young *burchelli*; the Klip R., Natal, specimens, as Weber himself pointed out, differ from the Laingsburg types, and are definitely not *anoplus*.

This species is not a Red-fin, nor does it develop warts on head in ♂. In life the colour is metallic silver, slightly greyish above, with a yellow or golden (often very brilliant) tinge in ♂, but more silvery-grey in ♀; fins whitish, without even a pinkish suffusion, but in ♂ they (incl. caudal) may be yellowish. After preservation a more or less conspicuous dark lateral stripe.

Snout short, bluntly rounded, mouth terminal. One pair of barbels, developing at a length of 25 mm. Lat. line 34–36, caudal peduncle 16 (14 in juv. only), predorsal 13, radiate striæ *very numerous* 36–38. Scaling begins at a length of 23 mm. Lat. line tubules very inconstant posteriorly. Pectoral shorter in ♀ than in ♂.

Gouritz River system. Whether this species really occurs farther eastwards will be investigated in the near future.

Barbus afer Peters.

For the great kindness in sending me one of three types I have to thank Dr. Ahl of the Berlin Museum.

Boulenger's 1911 description is composite, the recorded specimen, with its figure, is *burchelli*. Gilchrist and Thompson repeat Boulenger's description; the records of Pellegrin (1920) and Fowler (1934) are probably erroneous.

The species appears to be valid. It might be *pallidus* as regards the scaling, but (in the specimen seen by me) has only one pair of barbels. It is larger (100 mm.) than any *pallidus* I have yet seen.

Mouth terminal or subterminal. One pair of barbels. Lat. line 27, caudal peduncle 12, predorsal 12, radiate striæ 8. Pectoral in ♀ not reaching to ventral. Lat. line tubules probably complete or nearly so (some scales missing).

"Cape Colony. Krebs coll." Efforts are being made to rediscover this species.

Barbus hospes, sp. n.

Length of head 3 (juv.)–3⅗ (ad.) in length of body (excl. caudal); eye 3 (juv.)–3½ (ad.) in head, 1–1⅗ in interorbital, subequal to snout in adult. Mouth inferior. Two pairs of barbels, developing *simultaneously*, both subequal to eye-diameter in adult. No warts on head in ♂.

D. iii. 7. 3rd spine thickened, serrated, about 14 serrations, those on proximal half directed apically (a feature not found in other South African species), those on distal half directed towards base of spine. When third spine extended at 60° from long axis of body, hind margin of fin also forms an angle of 60° (*paludinosus* spine at 60°, hind margin vertical). A. iii. 5. Pectoral not reaching ventral, which arises slightly in advance of dorsal. Caudal elongate, longest rays 3 (juv.)–2⅔ (ad) in body-length.

Scales with 3–6 very weak radiating striæ in posterior field, none in anterior field ; lat. line 37–39, caudal peduncle 16, between third dorsal spine and lat. line 6, between latter and ventral spine 4, between lat. line and anal spines 5, predorsal 21.

Silvery, fins pale, without red splashes. Paler at all stages than *paludinosus* caught and preserved at same time. Up to 63 mm.

Orange River, at Goodhouse, Namaqualand.

Barbus calidus, sp. n.

Length of head 3 (juv.)-3¾ (ad.) in length of body ; eye 3 (juv.)–3½ (ad.) in head, subequal to snout and to interorbital in adult. Two pairs of barbels. No warts on head in ♂.

D. iv. 7 *. 4th spine in adult thickened, with numerous strong close-set serrations. A. iii. 6 (–7). Pectoral reaching ventral in both sexes.

Scales with 4–5 (juv.) to 12–14 (ad) radiating striæ ; lat. line 36–37, caudal peduncle 16 in adult, between dorsal spine and lat. line 6, between latter and ventral spine 3, predorsal 15.

Silvery, often with yellowish tinge, darker on back, sometimes a dark lateral stripe (usually not conspicuous until after preservation), caudal fin often pinkish, other fins with bright red splashes at their bases. Up to 93 mm.

The only Red-fin species with serrated dorsal spine.

Olifants River system, Clanwilliam, Cape.

* Several other species, e. g., *burchelli*, having actually four dorsal spines, but the first is very small and in adults becomes obscured, so that for practical purposes only three are counted. In *calidus* the first spine is more distinct even in adult than usual, and should not be overlooked.

Barbus tenuis, sp. n.

Close to *asper* Blgr. Depth of body *less* than length of head even in gravid ♀; length of head 3¾ (juv.)–4 (ad.) in length of body; eye 2½ (juv.)–5 (ad.) in head. Snout rounded, projecting beyond mouth, which is definitely inferior and included. One pair of barbels, developing at a length of 22 mm. No warts on head in ♂.

D. iii. 7. 3rd spine slender, non-serrate. A. iii. 5. Pectoral shorter in ♀ than in ♂. Ventral in advance of dorsal.

Scales with *numerous* radiating striæ, up to 24; lat. line 32–36, between dorsal spine and lat. line 5, between latter and ventral spine 3, caudal peduncle 12–14, predorsal 15–20, beginning a little distance behind occipital region, thus leaving a more or less triangular *bare patch* (*asper*: 19–25, without bare patch). Lat. line tubules usually complete (*asper*: very inconstant).

Silvery, strongly suffused with brownish, especially above (*asper*: silvery with dark dots like a "speckled hen"), bases of dorsal, anal, pectoral, and ventral with bright red splashes. After preservation a dark lateral stripe, much more conspicuous than in *asper*. Up to 85 mm.

The scales with their numerous striæ are like those of *anoplus*, but in specimens which have lost all trace of colour the caudal peduncle scales and the bare post-occipital patch will be found decisive.

Gouritz River system.

Barbus phlegethon, sp. n.

Length of head 3½ (juv.)–4 (ad.) in length of body; eye 3 (juv.)–3¼ (ad.) in length of head. Mouth subinferior or inferior. One pair of barbels, not exceeding ½ eye-diameter, and developing at a comparatively late stage (37 mm.). No warts on head in ♂.

D. iii. 7. 3rd spine slender, non-serrate. A. iii. 5. Pectoral shorter in ♀ than in ♂. Ventral spine below 3rd dorsal spine.

Scales with few radiating striæ, up to 7–8; lat. line 34–36, between dorsal spine and lat. line 4–5, between latter and ventral spine 3, caudal peduncle 12, predorsal 14–16. Lat. line tubules complete, seldom one or two absent posteriorly.

Silver, rather strongly suffused with brownish above, bases of dorsal, anal, pectoral, and ventral with bright red splashes ; caudal also often red ; a dark lateral stripe after preservation. Up to 55 mm.

Somewhat like *tenuis*, but depth subequal to length of head, ventrals less far forward, scales with fewer striæ, and predorsal scales beginning immediately behind occipital region (no bare patch).

Olifants River, Clanwilliam, Cape.

Barbus cernuus, sp. n.

Extremely like *anoplus* Weber ; in fact, isolated Museum specimens without definite locality probably cannot be satisfactorily assigned to one or the other species. It has the same short rounded snout (" Chubby-nose "). One pair of barbels developing at a length of 21 mm. ; occasionally a rudimentary anterior barbel is developed, either on one or both sides (*anoplus* : never more than the one pair). No warts on head in ♂.

Length of head 3½ (juv.)–4 (ad.) in length of body (*anoplus* : 3⅛–3¾ or 4). Eye 3 (juv.)-4 (ad.) in length of head (*anoplus* : very slightly larger). Gill-rakers 2+4 or 5 on anterior arch (*anoplus* : 2+6 or 7). Scaling begins at a length of 15 mm. Scales with numerous radiating striæ, up to 30 (*anoplus* : up to 36) ; lat. line 33–35, caudal peduncle 16 (ad.), predorsal 14–15 (*anoplus* : 13). Lat. line tubules usually complete or nearly so (*anoplus* : very inconstant, often greatly reduced).

Metallic silvery, with a pinkish or violet sheen, especially in ♂, fins pale ,without pink tinge or red splashes. Up to 65 mm.

Olifants River, Clanwilliam, Cape.

This species and *anoplus* form a very distinctive pair among the species found in the S.W. Cape, distinguished by their neat compact body-form and rounded snout, their glistening silvery colour, without red splashes on the fins, no warts on head in ♂. The necessity for two species may seem doubtful, but *they can be distinguished*, and attention is drawn to the occasional rudimentary development of an anterior barbel in *cernuus*, and the distinct lag in development of the scaling and posterior barbel in *anoplus* ; on the other hand, the full complement (16) of scales around the caudal peduncle is attained sooner in *anoplus* than in *cernuus*. Topographical considerations will be given in a later paper.

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[ELEVENTH SERIES.]

No. 8. AUGUST 1938.

XI.—*The Osteology of* Zaprora silenus *Jordan, with Notes on its Distribution and Early Life-history.* By WILBERT M. CHAPMAN and LAWRENCE D. TOWNSEND, State of Washington, Department of Fisheries.

SINCE the description of *Zaprora silenus* by Jordan (1897) there have been few additional records of the capture of this species. Evermann and Goldsborough (1907) and Halkett (1913) both record a second specimen which, according to Dymond (1928), was taken in the Strait of Juan de Fuca, near Victoria, B.C. A third specimen was recorded by Kendall (1924) from lat. 58° 05′ N., long. 149° W., on the "south-east corner" of Portlock Bank. Dymond (1928) reports another specimen taken off Anthony Island in the North Pacific, stating that two or three other specimens were taken at the same time but were not brought ashore. Schultz (1934) recorded nine additional specimens, one from the south-west coast of Vancouver Island and the others from the vicinity of Sitkalidak and Kodiak Islands, and from Akutan Island. Thus the total number of specimens of this species known to science has been brought to thirteen, and its range established from the Strait of Juan de Fuca on the south to Akutan Island, Alaska, on the north and west.

In the more than 2500 plankton hauls made by the International Fisheries Commission (I. F. C.) in the northeast Pacific during their investigation of the Pacific halibut there have appeared thirty-six specimens of *Zaprora silenus* ranging in length (without caudal) from 11·2 to 72·0 mm.

With the exception of a few measurements and counts made upon one specimen by Dymond (1928) there has been no description of the species since that of Jordan (1897), which, according to him, was based on a partially skinned and stuffed specimen. There have been no descriptions of post larval stages or osteology. Therefore, a short description of the adult and post-larval stages has been included below, together with a description of the osteology.

The writers are indebted to Dr. W. F. Thompson, Director of Investigations of the International Fisheries Commission, for permission to work upon the specimens in the I F. C. collection, to Dr. L. P. Schultz, of the U.S. National Museum, while associated with the School of Fisheries, University of Washington, and to Dr. C. L. Hubbs, Museum of Zoology, University of Michigan, for the loan of specimens.

DISTRIBUTION.

All of the specimens in the I. F. C. collection, with the exception of one taken May 13, 1930, in Dixon Entrance, were collected in May, June, and July of 1930, 1931, and 1932, south of the Alaska Peninsula from Afognak Island to the Shumagin Islands (between 151° W. and 161° W. longitude). Most of them occurred in hauls on the continental shelf, only one specimen being taken at a station where the bottom sounding was as great as 250 metres.

By referring to the list of net-haul stations given in Thompson and Van Cleve (1936) it may be seen that subsequent to the middle of May there were no hauls taken over the continental shelf except in the western part of the Gulf of Alaska and two in Dixon Entrance. This may account for the absence of this species in the numerous net-hauls made by the I. F. C. along the coasts of British Columbia and south-eastern Alaska, because all the stations made in this area were taken either over deep water or prior to the middle of May.

Zaprora silenus has been taken at I. F. C. stations 376, 460, 463, 475, 483, 518, 527, 538, 544, 554, 557, 560, 569, 599, 604, 753 A, 758, 791, 807, 811, 814, 818, 819, complete data for which are given in Thompson and Van Cleve (1936).

DESCRIPTION OF *ZAPRORA SILENUS*.

The description of the adult stages is based upon nine specimens in the I. F. C. collection; five from the Museum of Zoology of the University of Michigan; one from the Collection of Fishes, University of Washington; and a large specimen in the Spokane Street cold storage plant, Seattle, Washington.

Dorsal rays 54 to 57 (55·9) *. Anal rays 29 to 30 (29·1). Caudal rays 30 to 31 (30·5). Pectoral rays 24 to 25 (24·9). Body proportions in the length without caudal: head 2·9 to 3·4 (3·1); snout to dorsal origin 3·0 to 4·3 (3·6); snout to anal origin 1·6 to 1·7 (1·6); depth at pectoral insertion 2·9 to 4·2 (3·9); length of pectoral 4·1 to 4·8 (4·3); length of caudal 4·2 to 4·8 (4·4). Body proportions in the head: depth of caudal peduncle 2·3 to 4·2 (3·2); length of snout 4·3 to 6·2 (5·0); diameter of eye 2·2 to 3·1 (2·7); length of maxillary 2·4 to 2·8 (2·7); interorbital space 2·4 to 2·8 (2·6); length of the longest dorsal ray 1·8 to 4·2 (2·9); length of longest anal ray 1·5 to 3·4 (2·3); length of pectoral 1·2 to 1·6 (1·4); length of pectoral base 2·3 to 3·4 (2·8); length of caudal 1·2 to 1·6 (1·4). Depth at caudal peduncle divided by the length of the caudal peduncle 0·8 to 2·0 (1·2). The colour in alcohol is a light brown on the dorsal portion of the body shading into a tan on the belly and underside of the head. The dorsal fin has seven wide vertical dark bars, which are wider than the light interspaces. The anal fin has three similar bars. The caudal and pectoral fins are unmarked. There is no differentiation of colour around the pores on the head. The specimen 132 mm. in length without caudal has the dorsal and anal fins dark but without distinct bars. The pectorals and the caudal are likewise darker than the body, especially around the edges. The body and the caudal fin are blotched with many small light spots.

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* The figures outside the parentheses indicate the range of the measurement or count, while the number inside is the mean.

A few differences may be noted between these specimens and Jordan's large specimen. There is a distinct lateral line, with a few pores, that extends to the base of the caudal fin. The gill membranes (as mentioned by Schultz, 1934) are attached to the tip of the isthmus and form a wide free fold behind The opercle is not adnate to the shoulder-girdle at its dorsal angle. The pectoral rays are consistently 24 or 25 in number. The caudal rays range from 31 to 34 in number, while in the description of the type they were given as 22. This large difference between the descriptions of the type and our specimens can probably be accounted for by the fact that in the larger specimens (such as the one in the Spokane Street cold storage plant, Seattle, Washington) the short rays which extend dorsally and ventrally along the caudal peduncle are so overgrown by skin that they become completely obscured. They might, therefore, be easily overlooked. Several of the body proportions differ considerably from those of the type, but these differences can probably be attributed to change during growth.

DESCRIPTION OF POST-LARVAL STAGES.

The material used in the study of the post-larval stages of *Zaprora* consists of twenty-seven specimens ranging in total length from 11·5 to 27·5 mm. The series of stages is continuous by very small steps in development from the 11·5 mm. specimen up into the series of stages which can be recognized entirely by their adult characters.

The post-larvæ of *Zaprora* are characterized in these stages by the presence of dense pigment on the sides of the body and by the large, wide, and well-developed pectoral fins. In the older stages, in which the fin-rays are formed, the long, slightly pigmented dorsal and anal fins with their characteristic numbers of rays are distinctive.

Although we possess stages for every millimetre of length from 11·5 to 27·5 mm., it will be convenient to base the descriptions upon a specimen of 12·7 mm. total length (fig. 9) and another of 24·0 mm. (fig. 10).

Specimens 27·5 mm. in total length possess a full complement of caudal rays and are considered to be fully recognizable by their adult characters.

Post-larval stage of 12·7 *mm.:*

The sides of the body are densely covered with stellate pigment spots, which fade out abruptly on the caudal peduncle. There is an indistinct arrangement of these spots along the site of the developing lateral line, but there is no other pigment pattern on the body. The base of the pectoral and an area on the top of the head in the interorbital region are blotched with pigment-spots. Strips of pigmentation extend from the snout along the upper jaw to connect with others running below the eye and posteriorly nearly to the margin of the opercle. The primitive median fin-folds are unpigmented.

In this stage, as well as in all the younger ones which we have, primitive pectoral and caudal rays are present. The number of pectoral rays cannot, however, be counted with certainty until a length of 15·5 mm. is reached.

The outline of the body tapers evenly from the middle of the head to the caudal peduncle. The abdomen protrudes sharply beyond the anterior third of the ventral outline, and a definite and extensive preanal fin-fold extends forward from the projecting vent. The head of the earliest stage is 23 per cent. of the length, but it rapidly increases in proportion until at 15·0 mm. it amounts to 29 per cent., and in larger specimens accounts for one-third of the length.

The eye in young stages has a peculiar constriction which encroaches upon the pupil from the dorsal and ventral surfaces, but more noticeably from the former. This condition gradually disappears with increase in size.

Post-larval stage of 24·0 *mm.:*

The rays of the dorsal, anal, and pectoral fins are completely formed. The number of dorsal and anal rays provide useful confirmatory characters for specimens of this size, as may be seen by comparing these counts (dorsal 55 to 57 [55·7]; anal 29 to 31 [29·8]) with those for the adults on p. 91. The number of pectoral rays as counted on ten post-larval specimens (average 24·4) falls slightly below the number for nine older stages (average 24·9), the difference doubtless being due to the difficulty in distinguishing the outer rays in the smaller specimens.

At this length the fish still retains the general feature of the dense lateral pigmentation of the body so characteristic of small specimens. A more definite pattern appears in the form of a vague arrangement of the pigment spots which mark each myotome. The spots are scattered and faded on the caudal peduncle. They are not found on the ventral surface of the body from the anterior third of the anal fin to the head The base of the pectoral fin is spotted, as are the lateral and dorsal surfaces of the head. The pigmentation of the latter forms a pattern more or less concentric with the eye. There is some fine pigment on the skin of the lips. The membranes of the dorsal and anal fins are irregularly pigmented, but the fin-fold remaining between the dorsal and caudal fins and the caudal fin are unpigmented.

The greatest depth is at the first dorsal ray. From this point there is a gradual taper of the robust body to the narrowest part of the caudal peduncle. This taper is broken on the ventral surface due to the protruding abdomen, resulting in a "step" behind the anus. There is a minute remnant of the preanal fin-fold.

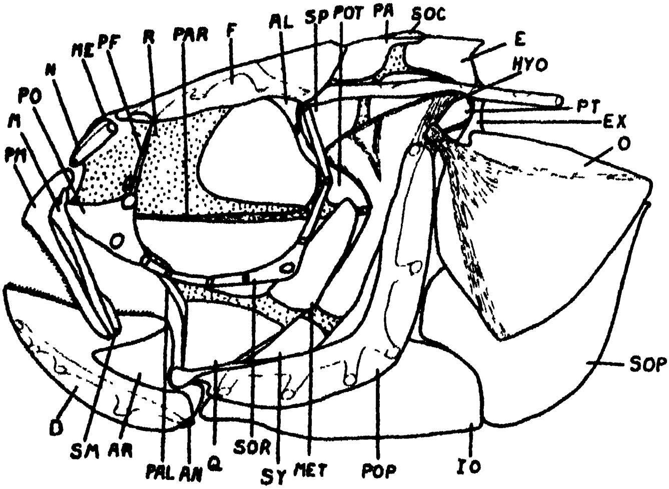
The bones of the head are well formed at an earlier stage and show up prominently in the 24·0 mm. specimen. The snout is more pointed than in adult specimens, but is nevertheless quite blunt. The jaws are large and well formed. The branchiostegal rays show only slightly in lateral view. The head is definitely larger and more robust in this than in smaller stages. The depth has also increased in proportion to the length, and this is reflected in a concomitant increase in the depth of the caudal peduncle. Other body proportions, such as length from snout to anus, length of the jaw, length of snout, and size of the eye do not change materially.

The shape of the eye and its position in relation to the anterior-dorsal profile has changed somewhat from the earlier stages. There remains no evidence of the constriction of the pupil. The eye is separated from a vertical point on the dorsal profile by a distance equal to half the eye diameter, and from the nearest point on the profile (about 45° anterior to the vertical) by one-third of this distance.

Osteology.

In this section are described the skeletal elements of a specimen 72·0 mm. in length without the caudal, taken in a Petersen's young fish trawl in Cold Bay, Alaska, on July 22, 1931, and of a specimen 132 mm. long without the caudal, taken at Akutan Island, Alaska, in August 1931.

Fig. 1.

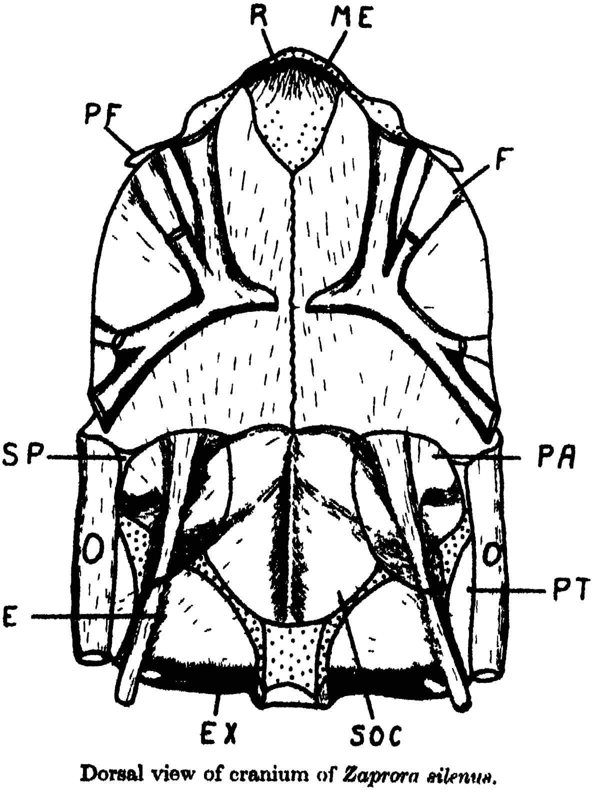


Lateral view of head-skeleton of *Zaprora silenus.*

Antorbital Portion of the Cranium.

The antorbital portion of the cranium consists mainly of a large cartilaginous element, the *rostral cartilage* (figs. 1, 2, and 3). Anteriorly it rises abruptly from the vomer to the mesethmoid, leaving a shallow median concavity into which the posterior processes of the premaxillaries project. The lateral surfaces in front of the prefrontals are concave. The ventral side of the cartilage is flat and smooth. Upon it lie the vomer and the parasphenoid. The posterior edge of the cartilage occludes the anterior half of the interorbital space and is somewhat semicircular, reaching to the alisphenoids on its dorsal end and to the prootics on its ventral end. The posterior side of the cartilage is narrow and slightly concave. Immediately behind the prefrontal and below the foramen of the olfactory nerve on each side the cartilage is deeply concave. In this pit are inserted the superior oblique and the inferior oblique muscles of the eye. Just anterior to the ventral edge of each prefrontal the rostral cartilage bears a concavity which fits over the anterior edge of the adjacent facet of the palatine.

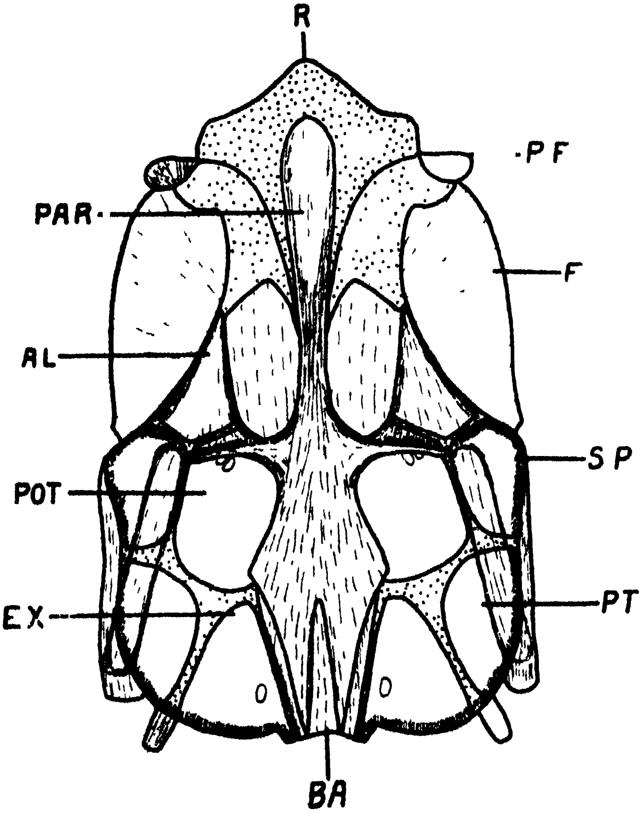
Fig. 2



Dorsal view of cranium of *Zaprora silenus*.

Projecting laterally from this cartilage are the thin wing-like *prefrontals* (figs. 1, 2, 3). The lateral portion of each is fully ossified and thin, but dorsally the element is cartilaginous and is indistinguishable from the rostral cartilage. On the postero-ventral edge of the element is a cartilaginous condyle which articulates with a shallow facet in the mesial side of the preorbital. Where the ventral end of each prefrontal merges into the rostral cartilage is a small process that fits into the facet on the dorsal side of the palatine. The prefrontals are separated

Fig. 3.



Ventral view of cranium of *Zaprora silenus*.

from the rostral cartilage mesially by the large foramina of the olfactory nerves, which emerge from the brain capsule at the most anterior part of the indentation of the posterior edge of the rostral cartilage.

On the dorsal side of the rostral cartilage is the median *mesethmoid* ossification (figs. 1, 2). It is well ossified anteriorly, but ventrally and posteriorly, where it is exposed by the diverging anterior edges of the frontals, it is cartilaginous and merges indistinguishably into the rostral cartilage. This element is broad and flat on its dorsal surface.

The *vomer* is a broad, thin, superficial bone lying partially on the rostral cartilage and partially on the anterior end of the parasphenoid. Anteriorly it curls around the edge of the rostral cartilage. It bears no teeth. It is separated from the mesethmoid by a wide area of cartilage.

The *parasphenoid* (figs. 1, 3) runs along the ventral side of the cranium from a point even with the bases of the prefrontals to the basioccipital condyle. Its anterior end is overlain by the vomer for a short distance. From this end to the prootics the bone is narrow and lies along the rostral cartilage. At the anterior edges of the prootics the parasphenoid sends up lateral wings to the dorsal edges of those bones which form narrow bridges over the spaces between the foramina of the trigeminal and facial nerves. Posteriorly, over the basioccipital, the bone splits into two V-shaped segments which end in sharp points at the base of the basioccipital condyle. A wedge of the basioccipital is exposed between these divergent tips.

The *frontals* (figs. 1, 2, 3) are the largest bones of the cranium, extending from the anterior edge of the mesethmoid to the sphenotics, and bridging, at this latter point, the entire width of the cranium. Anteriorly they diverge to expose a V-shaped section of the mesethmoid. Posteriorly they overlie a small portion of the sphenotics and the median supraoccipital, and are in turn slightly overlain by the parietals. On its lateral edge, from the sphenotic to its anterior end, each frontal bears a neural tube which terminates anteriorly in a pore over the anterior edge of the eye, bears a second over the pupil of the eye, and a third over the posterior portion of the eye. This is the neural tube that continues posteriorly over the surface of the sphenotic and the pterotic and projects past the end of the cranium to the base of the posttemporal. There it opens to the surface of the head by four pores, the first two being on the pterotic (one at the middle of the bone and one at the posterior end), the third between the pterotic and the posttemporal, and the fourth on the base of the posttemporal. This tube extends past the anterior end of each frontal and through the nasals.

Postorbital Portion of the Cranium.

On the posterior portion of the dorsal surface of the cranium there is a heavily ossified ridge running along the parietal and the epiotic of each side (figs. 1, 2). Over the epiotic the ridge is flattened and upon it lies the anterior end of the dorsal fork of the posttemporal. Between this ridge and the crest of the supraoccipital the cranium is slightly concave. Between this ridge and the lateral edges of the pterotic and sphenotic there is another, very deep, concavity. In these cavities the anterior trunk-muscles are attached. In the larger specimen the ridge is higher and the posttemporal fork lies on its mesial side.

The *supraoccipital* (figs. 1, 2) is a median dorsal ossification extending from the frontals to the foramen magnum, and lying between the parietal and epiotic of each side. Its shield-shaped dorsal section is well ossified, but the posterior portion of the element is mainly cartilaginous. The bone bears a low median crest that runs from the frontals halfway to the foramen magnum. Anteriorly the bone is slightly overlain by the frontals; laterally a portion of it is covered by the parietals. It is separated from the epiotics and the exoccipitals by a continuous band of cartilage.

The *parietals* (figs. 1, 2) are superficial ossifications lying lateral to the supraoccipital. Anteriorly they overlie the edge of the frontals; laterally they extend over a portion of the sphenotics; mesially they partially cover the supraoccipital; and posteriorly the abovementioned ridge of each parietal extends over the band of cartilage that separates the epiotic from the other cartilage bones of the skull. Lateral to this ridge the bone is deeply concave.

The *epiotics* (figs. 1, 2) lie between the supraoccipital and the pterotics, and form a portion of the posterior edge of the cranium. The median ridge of each bone is flattened and receives the anterior end of the dorsal fork of the posttemporal. This ridge projects a short way past the posterior outline of the bone, as is shown in fig. 1. Each epiotic is separated from the supra-occipital, pterotic, and exoccipital by a continuous band of cartilage.

The *sphenotics* (figs. 1, 2, 3) are small bones lying at the postero-dorsal edge of the orbit. Each has a dorsal and anterior and a lateral face. The dorsal face is overlain by the frontal, the parietal, and the ossification of the neural tube, so that only a small portion of it is exposed. The anterior face forms a portion of the orbit. Each bone is separated from the alisphenoid, prootic, and pterotic of its side by a continuous band of cartilage. Along the cartilage between the sphenotic and the prootic, and overlying the ventral edge of the sphenotic, lies the anterior half of the articular head of the hyomandibular. The ossification of the neural tube is firmly joined to the dorsal surface of the bone.

Each *pterotic* (figs. 1, 2, 3) has the shape of a flattened cone, with one side ventral, the other dorsal, and the apex forming the postero-lateral corner of the cranium. On the ventral side of each bone the articulating surface of the hyomandibular crosses at an angle from the junction of the bone with the sphenotic and prootic to this postero-lateral corner. On the lateral edge of the dorsal surface lies the ossification of the neural tube mentioned in the description of the frontals. It extends out over the lateral edge posteriorly. In the smaller specimen the ossification of the neural tube is more or less loosely attached to the pterotic and can be easily removed from that bone, but in the larger specimen it has become thoroughly ankylosed to the lateral edge of the dorsal surface of the bone.

The *alisphenoids* (figs. 1, 3) are triangular bones with a posterior edge abutting against a cartilaginous strip between it and the sphenotic and prootic and a dorsal edge running along the underside of the frontal to the rostral cartilage.

The *prootics* (figs. 1, 3) are large bones forming the anterior portion of the lateral face of the brain-case. Each bone is separated from the alisphenoid, sphenotic, pterotic, and exoccipital of its side, from the basioccipital, and from its mate ventrally by a continuous band of cartilage. Dorso-anteriorly, where the bone bends mesially to form a portion of the orbit, there are the large foramina of the trigeminal and facial nerves. The trigeminal is the larger of the foramina and lies dorsal to the other one. Between the two is a very thin bridge of bone. The lateral wing of the parasphenoid projects over these foramina to the dorsal edge of the prootic. Ventrally the junction of the two prootics and the cartilage between them is overlain by the parasphenoid. On the interior of the cranium a shelf of cartilage between the two prootics and the basioccipital forms a large myodome in which the rectus muscle of the eyes are attached, and which separates them from the brain-case proper.

The *exoccipitals* (figs. 1, 2, 3) form most of the posterior surface of the cranium and part of the lateral surfaces. The bones of the opposite side arch over the foramen magnum, and are separated dorsally by a thin strip of cartilage that lies between them and the supra occipital. At the lower side of the foramen magnum each bone is thickened to form a condyle which articulates with a process on the atlas. Just below this condyle, on the posterior face of the bone, is the foramen of the first spinal nerve. Anterior to this foramen, and on the lateral surface of the bone, is the foramen of the vagus nerve. Ventrally the bones are separated by the basioccipital. The bones are separated from all the other bones of the cranium by a continuous band of cartilage.

The median *basioccipital* (fig. 3) forms the posterior part of the ventral surface of the brain-case. Posteriorly it is thickened to form the vertebra-like condyle. Anteriorly it broadens and is overlain by the posterior end of the parasphenoid. It, too, is separated from the other cartilage bones of the cranium by a narrow strip of cartilage.

Special Ossifications of the Sensory System.

The nasals (fig. 1) are small tubular bones lying loosely in the tissue between the mesethmoid and the nasal openings. Each is little more than a hollow tube around the neural canal, bearing an open pore at each end.

There is a ring of seven small neuromastic tubular bones (fig. 1) running around the lower margin of the eye from the middle of its anterior margin to the postero-lateral corner of the frontals. They surround the sub-orbital branch of the lateral line system, which opens to the surface by ten pores. The first bone anteriorly, the preorbital (or lachrymal), is the largest of the series and bears three pores, one at each end and one on its lower margin at its middle. The second bone is very short. The third and fourth are nearly twice as long as the second, and are both of about the same size. The fifth bone is larger and bears a pore in its middle on its ventral edge. The sixth and seventh are long and slender, the latter being the longer. There is a pore at each junction between the bones of this series.

The Upper Jaw.

The upper jaw consists of a premaxillary, maxillary, and supramaxillary. The *premaxillary* (fig. 1) is long and forms the whole upper edge of the gape, completely excluding the maxillary. At its mesial end a heavy prong projects postero-dorsally at right angle to the main portion of the bone. It slides over a groove in the maxillary into a median concavity in the anterior end of the rostral cartilage and reaches to the mesethmoid. The premaxillary bears eighteen slender conical teeth in the smaller specimen and twenty-eight in the larger. The *maxillary* is a bit shorter than the premaxillary, lies along the dorsal side of that bone, and is firmly bound to it anteriorly and posteriorly by connective tissue. The anterior end of the bone is slightly furcate, providing a shallow groove for the reception of the above-mentioned prong of the premaxillary. The ventral fork goes under the premaxillary prong ; the dorsal fork is short and ends in a knob that lies against the premaxillary prong and the rostral cartilage. Immediately behind this knob the bone is concave on its posterior side. Against this concavity abuts the anterior end of the palatine. Posteriorly the bone tapers to a point. On the dorsal side of the posterior quarter of the maxillary lies the thin, slenderly ovoid *supramaxillary* (fig. 1). The maxillary extends to a vertical through the anterior edge of the eye.

Mandible.

The mandible (fig. 1) consists of a dentary, articular, angular, and Meckel's cartilage. No *sesamoid articulare* could be discerned. The V-shaped *dentary* is the largest bone of the mandible. It bears twenty teeth on its upper surface in the smaller specimen and thirty-five in the larger. On its lower surface it is pierced by a neural canal which opens to the surface by four pores. Into the "V" of the dentary fits the *articular*, which is thick and heavily ossified on its posterior edge, where it has a facet which articulates with the condyle of the quadrate. The *angular* is very small, situated at the postero-ventral corner of the mandible, and receives the stout ligament of the interopercle. Meckel's cartilage is a rod of cartilage extending from the posterior half of the articular along the mesial side of that bone and the dentary nearly to the symphysis of the jaw. The adductor mandibularis muscle is inserted on the Meckel's cartilage over the articular without the intervention of a sesamoid articulare ossification.

Palatine Arch.

The *palatine* (fig. 1) ends anteriorly in a cartilaginous condyle which articulates with a facet on the posterior face of the mesial end of the maxillary. Directly behind this, over the broadest part of the bone, where it begins to bend ventrally, is a shallow, cartilage-lined facet on the dorsal side which articulates with the ventral junction of the prefrontal and the rostral cartilage. The bone curves downward as a thin splint to the condyle of the quadrate, entirely shutting that bone out from the border of the mouth. The character of the bone would indicate that it may be the result of the fusion of the palatine (the dorsal portion) and the pterygoid (the ventral portion). The condition of the specimens at hand, however, would not allow a definite statement that more than the palatine is involved. If this is the case, the pterygoid is entirely absent. The palatine bears no teeth.

The *quadrate* (fig. 1) has the typical quadrant shape, with a heavily ossified condyle at its ventral corner for the articulation with the articular bone of the mandible. Projecting posteriorly from this condyle into a groove on the dorsal edge of the preopercle is a long splint of bone. There is an interosseous space between the symplectic and the posterior edge of the quadrate. Along the dorsal edge of the bone there is a wide band of cartilage separating it from the metapterygoid, and which runs anteriorly between the quadrate and the palatine.

There is no mesopterygoid. In the position usually occupied by that bone there is only a light membrane.

The *metapterygoid* (fig. 1) is a wedge-shaped bone with the point reaching to the dorsal head of the hyomandibular (to which it is attached by a ligament) and the broad end abutting against the above-mentioned band of cartilage between it and the quadrate. The bone is moderately well ossified dorsally, but is cartilaginous ventrally and is thick. There is a space between it and the hyomandibular.

Hyoid Arch.

The *hyomandibular* (fig. 1) terminates dorsally in a cartilage-capped condyle whose straight dorsal edge is half as long as the dorso-ventral length of the bone. This condyle articulates with the cranium along the junction of the sphenotic and the prootic, and along the lateral face of the pterotic. Although it is a single condyle, the portion articulating with the sphenotic and that articulating with the pterotic are thickened with a thinner wedge in between them, so that the condyle has the appearance of being double. The base of the sphenotic portion of the condyle is pierced by the truncus hyoido-mandibularis facialis nerve. The nerve enters the bone on its mesial side, proceeds ventrally and a little posteriorly, and emerges on the posterior edge of the bone from where it then extends along the anterior edge of the preopercle. The pterotic portion of the condyle is much broader than the sphenotic portion. The double character of this condyle is reminiscent of the condition found in *Pleuronectes* (Cole and Johnstone, 1901) and in other fishes, where there are actually two separate condyles on the hyomandibular, one articulating with the sphenotic and the other with the pterotic.

Projecting posteriorly from this cranial condyle is the opercular condyle, which is likewise capped with cartilage, is much smaller than the above, and articulates with the facet of the opercle. Below these condyles the bone is broader and more cartilaginous. It abuts against a band of cartilage that lies between it and the symplectic. There is no space between the hyomandibular and the preopercle. The dorsal arm of the preopercle extends up the posterior edge of the former almost to the opercular condyle, except where the above-mentioned nerve emerges from the hyomandibular.

The *symplectic* (fig. 1) is a small awl-shaped bone projecting at an antero-ventral angle from the hyomandibular into the space between the quadrate and the preopercle. The broad end is postero-dorsal, is thick and cartilaginous, and abuts against the above-mentioned pad of cartilage between the symplectic and the hyomandibular. The pointed anterior end reaches to the angle between the main body of the quadrate and the latter's posteriorly projecting splint. This point is completely ossified. There is a space between the symplectic and the quadrate and between the symplectic and the preopercle. The pad of cartilage between the hyomandibular and the symplectic is not continuous with the cartilage between the elements of the palatine arch, although it adjoins it.

The *interhyal* is a tiny well-ossified rod of bone capped with cartilage on each end. Its dorsal end is inserted upon the mesial side of the band of cartilage between the symplectic and the hyomandibular; the ventral end is attached to the postero-dorsal edge of the epihyal.

The *epihyal* is a large, flat, nearly circular element. It is well ossified in its centre but is cartilaginous about its border, especially at its junction with the ceratohyal.

The *ceratohyal* has an elongate hour-glass shape. The flat, posterior end is cartilaginous where it joins the epihyal, so that there is a considerable amount of cartilage between the ossified portions of these two elements. The constricted central portion is well ossified. The anterior end is cartilaginous and bears two facets in which the hypohyals rest.

The *hypohyals* are double on each side. The ventral one is the smaller and ends ventrally in a well-ossified tip which receives a short, stout ligament from the urohyal. Its dorsal end is cartilaginous. The dorsal hypohyal is almost entirely cartilaginous and abuts dorsally against the glossohyal.

The *glossohyal* is a flat, fan-shaped element which forms the greater part of the tongue. It is ossified only posteriorly where it is constricted, and abuts against the first basibranchial. There are no teeth on its dorsal surface and no prominent keel on its ventral surface.

The *urohyal* is a short, small bone situated directly behind the hypohyals at the apex of the isthmus. On its lateral surface are inserted the subbranchial muscles. From its anterior end two short ligaments go forward, one to each ventral hypohyal. Ventrally it is flat and slightly concave.

There are six *branchiostegal rays*. Two articulate on the epihyal, one on the cartilage between the epihyal and the ceratohyal, and three on the posterior half of the ceratohyal.

Opercular Apparatus.

All four of the opercular elements are present—the opercle, the subopercle, the interopercle, and the preopercle.

The *opercle* (fig. 1) is a nearly triangular bone forming the upper portion of the gill-cover. At its anterior angle it is most heavily ossified and bears a facet which articulates with the opercular arm of the hyomandibular. The lateral side of this facet is extended anteriorly past the dorsal end of the preopercle to the hyomandibular, so that the opercular arm of the hyomandibular is hidden from sight laterally. From this bony facet ridges of ossification extend out fan-wise into the remainder of the bone, which is otherwise very thin and lightly ossified. A heavy ridge extends along the anterior side of the bone to the ventral corner; another extends posteriorly to the posterior corner. Dorsal to this latter ridge there is a shelf of thin bone which lies over the levator operculi muscles. The postero-ventral edge of the bone is nearly straight and does not form a portion of the edge of the gill opening.

The *subopercle* (fig. 1) is a crescentic, lightly ossified, thin bone whose outer edge is wavy, and forms the entire posterior edge of the opercular apparatus. The postero-dorsal horn extends up to the posterior corner of the opercle, and is overlain along its anterior edge by that bone. The anterior dorsal horn is not overlain and projects into the space between the opercle and the preopercle. The anterior edge of the subopercle is concave and is overlapped by the posterior edge of the interopercle.

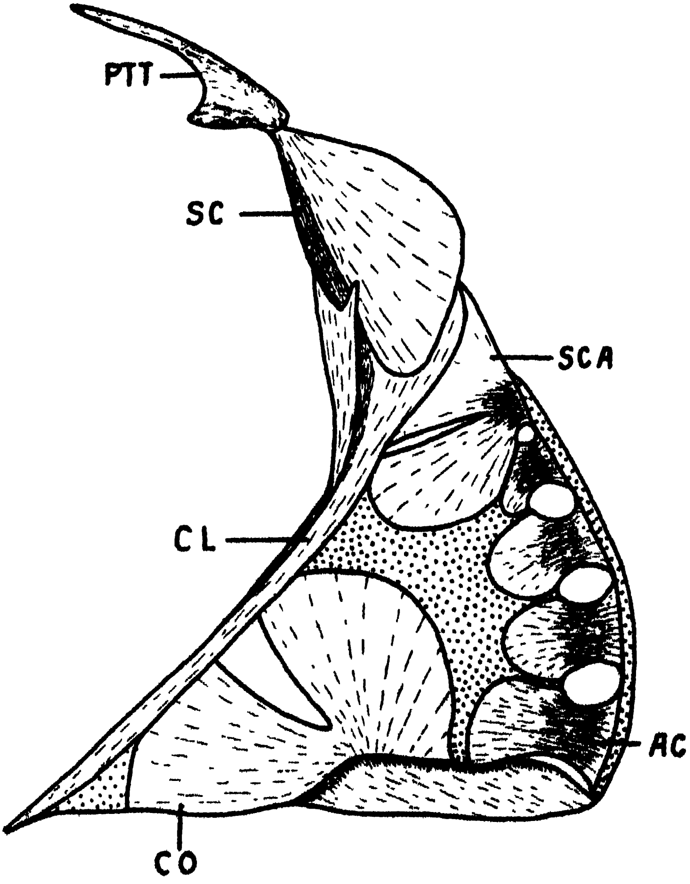
The *interopercle* (fig. 1) is a long, thin, triangular bone extending from the subopercle nearly to the anterior end of the preopercle. Here it sends a short, but broad and stout, ligament to the tiny angular. The bone is partially overlain dorsally by the preopercle. The ventral edge of the bone is wavy, continues the curve of the subopercle, and forms the ventral edge of the opercular apparatus.

The *preopercle* (fig. 1) is very little more than an ossification around the neural canal that it bears. This tube opens to the surface of the head by seven pores, one at the dorsal end of the bone, two on its posterior edge, one at the posterior edge of the bend, two along the ventral edge of the bone, and one at its anterior end. The bone is tightly bound to the ventral shaft of the hyomandibular dorsally. There is a space between it and the symplectic. Anteriorly there is a groove on the dorsal edge of the bone in which lies the splint of bone projecting posteriorly from the condyle of the quadrate.

Gill-arches.

There are four *basibranchials*, none of which bear teeth. There are hypobranchials on the first three gill-arches but none on the last. The *hypobranchial* of the first arch is capped with cartilage on both ends and constricted in its ossified middle portion. That of the second arch is similar but only half as long as that of the first. The hypobranchial of the third arch is little more than a ball of cartilage between the ceratobranchial and the basibranchial. The *ceratobranchials* are long well-ossified bones capped with cartilage on both ends. On the upper side of the gill-arches are the *epibranchials* and the *suprabranchials*, each of which is capped on both ends by cartilage. The suprabranchials of the first arch are toothless. Those of the second arch bear a group of small closely set teeth. Those of the third and fourth arches support jointly a larger plate of similar teeth. These teeth work against the teeth on the infrapharyngeals below. The *infrapharyngeals* are ceratobranchial-like ossifications in the anterior edge of the œsophagus that articulate ventrally on the posterior portion of the fourth basibranchial. On their anterior edge they bear a group of scattered, small, conical teeth. The *gill-rakers* are short and slender.

Fig. 4.



Lateral view of pectoral girdle of *Zaprora silenus*.

Shoulder-girdle.

The dorsal fork of the *posttemporal* (fig. 4) lies flatly upon, and is bound tightly to, the ridge of the epiotic for nearly half the length of the former. The ventral fork is small and is bound to the opisthotic by a stout ligament. At its ventral end the bone has a shallow socket on its mesial side which articulates with the dorsal end of the supracleithrum.

The *supracleithrum* (fig. 4) spreads out fan-wise from the dorsal knob with which it articulates with the mesial side of the posterior end of the posttemporal. The anterior edge of the bone is heavily ossified and is bent mesially so that it curves around the dorsal prong of the cleithrum. The remainder of the bone is very thin.

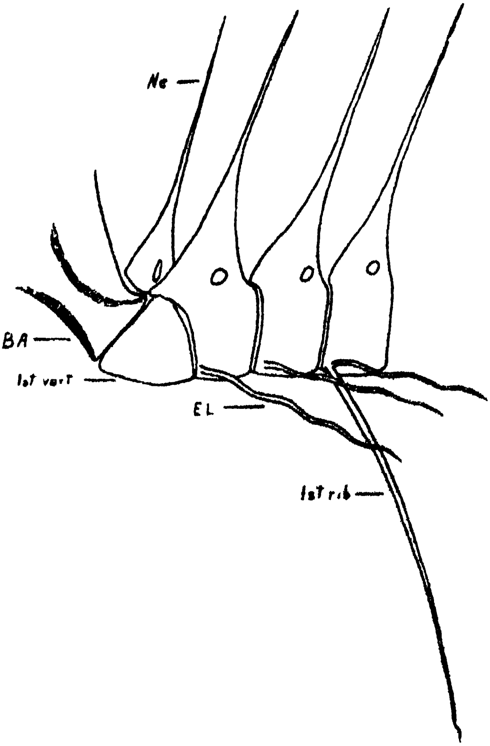
The dorsal end of the *cleithrum* (fig. 4) is shallowly furcate, with a long mesial prong which lies along the mesial side of the supracleithrum and a short lateral prong that provides a notch for the ventral part of the anterior edge of the supracleithrum to rest in. On the posterior edge of its median bend the cleithrum bears a wing-like projection which lies flat on the outer surface of the dorsal portion of the scapula and which is overlain by the ventral end of the supracleithrum. The rest of the bone is thin and flat on its anterior face.

The primary shoulder-girdle (fig. 4) is attached flatly to the inner edge of the cleithrum from the anterior end of that bone to just short of its dorsal tip. It projects ventrally from the cleithrum. The *scapula* lies at the bend of the cleithrum and is overlain on its lateral face by the posteriorly projecting wing of the cleithrum. At its posterior end it bears a condyle upon which the uppermost rays of the pectoral fin articulate. The usual foramen is present as a narrow horizontal slit running from the condyle to the anterior edge of the bone. Through it emerges the ventralis branch of the first spinal nerve.

The *coracoid* is larger than the scapula and likewise bears what at first appears to be a foramen. This is, however, the interosseous space found between the coracoid and the cleithrum in so many fishes. Here the anterior process of the coracoid is so large, and its edge of articulation with the cleithrum is so long, that the interosseous space is constricted until its depth is much greater than its cleithral length. On the ventral edge of the bone, and projecting posteriorly below the fourth actinost is a thin but well ossified process which is set in from the surface of the rest of the primary shoulder-girdle and provides an attachment for the muscles of this region.

There are four *actinosts*, which, with the condyle of the scapula, provide an articular surface for the rays of the fin. The first dorsally is the smallest, and is borne mainly by the scapula. The other three increase gradually in size and are borne on the cartilage that extends between these bones, between them and the coracoid, and between the coracoid and the scapula. They all have the usual hour-glass shape and are flat and wide.

Fig. 5



First four vertebræ of *Zaprora silenus*.

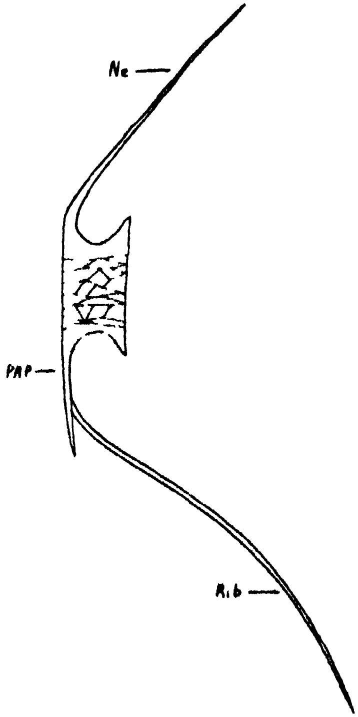
The actual articular surface for the fin-rays is a continuous band of cartilage running from the condyle of the scapula across the posterior ends of the actinosts.

The elements of the primary shoulder-girdle are separated from each other by a continuous band of cartilage. The elements themselves are largely cartilaginous. Stained in alizarin, only the constrictions of the actinosts and the scapular condyle show a distinct red; the rest of the elements become a faint pink, which, however, differentiates them plainly from the remaining cartilage.

Axial Skeleton.

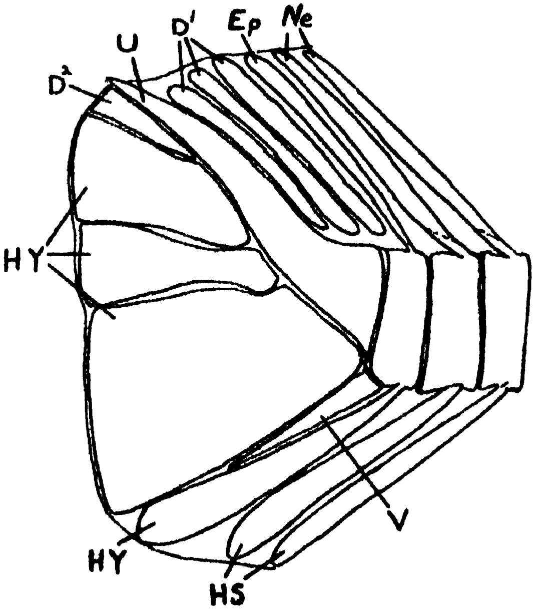
The vertebral column is composed of from 60 to 62 vertebræ, not counting the urostyle. Of these from 24 to 26 are precaudal. The first four vertebræ are somewhat modified (fig. 5) to form a firmer articulation with the cranium. The neural spine of the first vertebra is pushed forward by that of the second to partially cover the foramen magnum. The neural spine of the second vertebra is massive and broadened at the base, where it articulates slightly with the first vertebra. The neural spines of the succeeding vertebræ become smaller proximally until they are of the type shown in fig. 6.

Fig. 6.



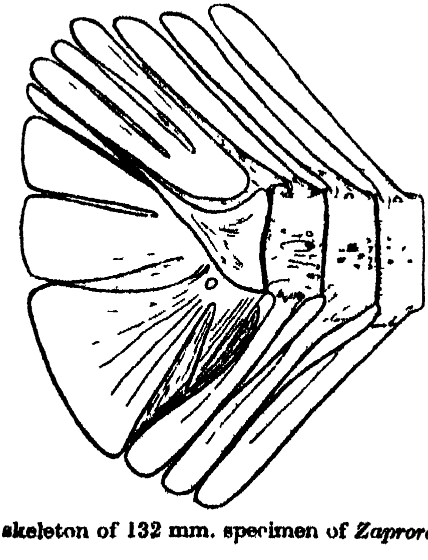
Twenty-second precaudal vertebra of *Zaprora silenus*.

Fig. 7.



Caudal skeleton of 33 5 mm specimen of *Zaprora silenus.*

Fig 8



Caudal skeleton of 132 mm. specimen of *Zaprora silenus.*

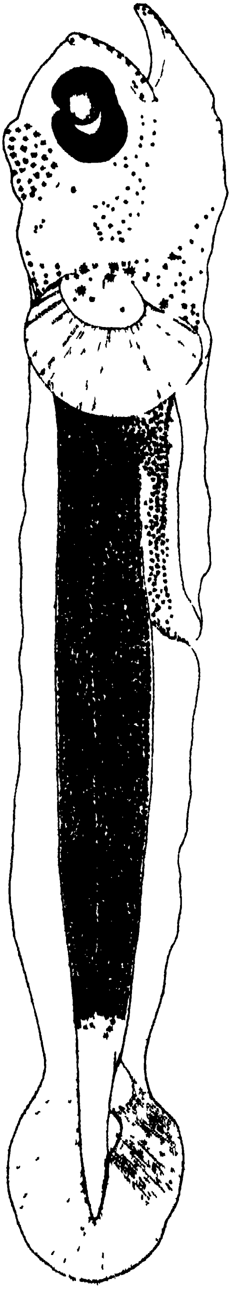


Fig. 9.

Zaprora silenus, 12·7 mm. total length.

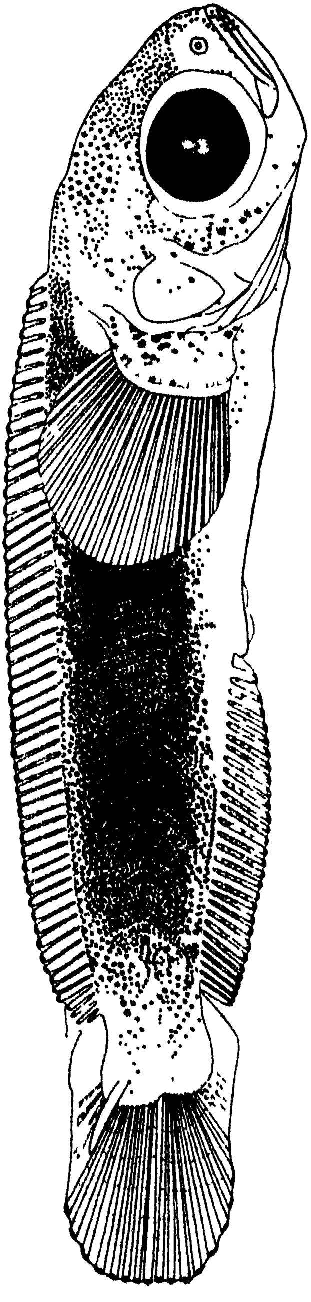


Fig. 10.

Zaprora silenus. 24·0 mm. total length.

The first three vertebræ do not bear ribs. The rib of the fourth vertebra (fig. 5) becomes atrophied and ligamentous for a short part of its length under the pectoral fin, and then becomes normal again as it extends ventrally (this ventral portion is not shown in fig. 5). The ribs of the fifth and succeeding precaudal vertebræ are normal. There are no epipleurals on the first vertebra. The ribs of the fourth and fifth vertebræ are sessile. Those of the succeeding precaudal vertebræ are supported on parapophyses; these parapophyses become successively longer on the vertebræ until they are long processes as shown in fig. 6. The basecosts of the dorsal fin are equal in number to the adjacent neural spines; each supports a single ray of the fin. All of the rays of the dorsal fin are spiny.

The caudal fin is broad and rounded. It has a typical teleostean homocercal skeleton, with rather incomplete secondary symmetry evidenced by the long urostyle (figs. 7 and 8) and the ventral displacement of the hypural elements. The last four centra contribute to the support of the caudal fin.

CONCLUSION.

Jordan at various times considered this species related to *Icosteus*, *Icichthys*, *Shedophilus*, *Acrotus*, *Centrolophus*, *Cryptocanthodes*, and *Bathymaster*. His latest decision (1923) placed the Zaporidæ with the Bathymasteridæ in the series Bathymasteriformes of the order Jugulares.

There appears to be little evidence to link *Zaprora* with the Bathymasteridæ (the following remarks on this family, unless otherwise noted, are based on dissections of *Ronquilus jordani*). The Bathymasteridæ have pelvic fins; *Zaprora* has none. The Bathymasteridæ (Regan, 1913) have a significantly less number of præcaudal vertebræ (14 to 15) than *Zaprora* (24 to 26), although the caudal vertebræ are nearly the same in number. The shoulder-girdle is greatly different *Ronquilus* has two broad but very thin post-cleithra; *Zaprora* has none. *Ronquilus* has a typically percoid primary shoulder-girdle, with the scapula and the coracoid separated by only a thin band of cartilage, and the two bones present a straight edge posteriorly to the actinosts. The coracoid sends a long narrow process anteriorly to the lower end of the cleithrum, leaving a long interosseus space between the two bones. The *Zaprora* shoulder-girdle (fig. 4), with the wide band of cartilage between the coracoid and the scapula and the peculiar coracoid, does not resemble this. The alveolar surface of the *Ronquilus* premaxillary is stout but not short, occupying but half the gape. The maxillary, while slender anteriorly, expands posteriorly, where it forms the border of the gape. There is no supramaxillary. This is widely different from the upper jaw of *Zaprora* (fig. 1), with its supramaxillary and the long slender maxillary which is completely excluded from the gape by the equally long and slender premaxillary. The frontals of the *Ronquilus* are very narrow between the eyes, in contrast to the wide interorbital space of *Zaprora*. The wing of the parasphenoid in *Ronquilus* is a relatively heavy broad structure reaching to the alisphenoid (but not to the frontal), whereas the same structure in *Zaprora* is slight and reaches only to the cartilage between the sphenotic and prootic. The bones of the suborbital ring are broader and stronger in *Ronquilus*. While very thin and poorly formed, there is a mesopterygoid in *Ronquilus*, whereas the bone is absent in *Zaprora*. There are some similarities, but the differences are large enough to warrant the exclusion of the Zaproridæ from any close relationship with the Bathymasteridæ.

Regan says (in a communication), "To-day I have re-examined *Cryptocanthodes*, and have confirmed that it has the characters that I assigned to the Stichæidæ in my paper on Blennioids (Ann. & Mag. Nat. Hist. 1912). *Zaprora*, as described, is not a Stichæid, but it may be a Blennioid of the Cliniform group." A comparison with the various families of this group as delineated in the above referred to paper shows that *Zaprora* bears little, if any, close relation to the fishes of that relationship.

Icichthys, *Shedophilus*, and *Centrolophus* (Centrolophidæ) share with the other Stromateoids the character of bearing numerous teeth in muscular sacs on each side of the œsophagus. These *Zaprora* does not have. These three genera bear well-developed pelvic fins; *Zaprora* has none. *Centrolophus* (acc. to Günther, 1860, p. 430) has 25 (11/14) vertebræ; *Zaprora* has more than twice as many. Any similarity between these three genera and *Zaprora* would appear to be superficial and related to the extended dorsal and anal fins only. The flabby body and weakly ossified bones of these fishes are in contrast to the stout body and firmly ossified structure of *Zaprora.*

The weakly ossified and largely cartilaginous skeletal structure of *Icosteus* (as illustrated by Regan, 1923) show very little, if anything, in common with *Zaprora. Icosteus* has pelvic fins. *Acrotus* likewise has the cranium largely cartilaginous. The cartilage bones are represented only by points of ossification in the cartilage, in complete distinction to *Zaprora.* If, however, the assumption (suggested by Regan, 1923) that the Icosteidæ "represent a specialized and somewhat degenerate development of the Perciform type" is true, it might be possible that the Zaproridæ represent a form of this line of development, but much nearer the Perciform type.

The systematic position and relationships of *Zaprora silenus* remain uncertain. It may be stated, from the present knowledge, that it represents an isolated branch of the Perciform type retaining certain primitive characters (such as the supramaxillary) but otherwise specialized and degenerate (postcleithra wanting, pelvic fins wanting, increased number of vertebræ, single elongated dorsal without articulated rays, elongate anal, coracoid and scapula well separated by cartilage, and a considerable amount of cartilage in the cranium). The last two items may be associated with the youth of the specimens examined. The longest specimen available for osteological study (132 mm.) was much smaller than the longest examined (732 mm.).

Abbreviations used in all figures.[*]

AC. Actinosts.
AL. Alisphenoid.
AN. Angular.
AR. Articular.
BA. Basioccipital.
CL. Cleithrum.
CO. Coracoid.
D. Dentary.
D^1, D^2. Dorsal caudal radials.
E. Epiotic.
EL. Epipleural.
EP. Epural.
EX. Exoccipital.
F. Frontal.
HS. Hæmal spine.
HY. Hypural.
HYO. Hyomandibular.
IO. Interopercle.
M. Maxillary.
ME Mesethmoid.
MET. Metapterygoid.
N. Nasal.
NE. Neural spine.
O. Opercle.
PA. Parietals.
PAL. Palatine.

PAP.	Parapophysis
PAR.	Parasphenoid.
PCL.	Postcleithrum.
PF.	Prefrontal.
PM.	Premaxillary.
PO.	Preorbital.
POP.	Preopercle.
POT.	Prootic.
PT.	Pterotic.
PTT.	Posttemporal.
Q	Quadrate.
R.	Rostral cartilage.
SC.	Supracleithrum.
SCA.	Scapula.
SM.	Supramaxillary.
SOC.	Supraoccipital.
SOP.	Subopercle.
SOR.	Suborbital ring.
SP.	Sphenotic.
SY.	Symplectic.
U.	Urostyle.
V.	Ventral caudal radial.

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XII.—*Sawflies of the Subfamily* Trichorhachinæ (Argidæ) (*Hymenoptera, Symphyta*). By ROBERT B. BENSON, M.A., Department of Entomology, British Museum (Natural History).

THE species of this subfamily (which I am defining in a forthcoming paper on the classification of sawflies) are, so far as is known, confined to West Australia, and up till now have been contained in the single genus *Trichorhachus* W. F. Kirby, 1882. Unfortunately, up to the present, they have been very little collected. Until recently only five badly-damaged specimens existed in the British Museum; four of these were types of different species, and only *T. nitidus* Kirby was represented in the female sex. In the various collections of Australian sawflies recently examined only the following representatives of this genus were found:—1 ♂ ? species in the South Australian Museum, Adelaide; 1 ♂ and 1 ♀ of *T. australis* (Westwood) in the Australian Museum, Sydney; 1 ♂, type of *Hylotoma* (*Schizocera*) *australis* Westwood, 1841, in the Hope Department, Oxford. I am not aware of the existence of specimens in any other collections.

In 1935 Mr. R. E. Turner visited West Australia and collected eleven specimens of the previously unknown female of *Trichorhachus australis* (Westwood) from flowers of *Leptospermum* sp. at Wanneroo, 42 miles N.E. of Perth. From this series it has been possible to distribute specimens to those Australian museums that had no representative of the subfamily.

Morice (1919, pp. 260–261) gave a key to the species based entirely on colour characters; actually, on the one hand, good structural differences between the species do exist, and, on the other hand, the colour of the antennæ, as used by Morice, seems to be unreliable. This paper is, then, primarily a re-study of the Kirby and Westwood types in comparison with Turner's more recent material, in the hope that it will thus be possible to interpret the species in Australia.

It is much to be hoped that entomologists visiting or resident in West Australia will keep a look out for further representatives of this interesting group. I am indebted to Prof. G. D. Hale Carpenter for lending me the type of *Hylotoma* (*Schizocera*) *australis* Westwood from the Hope Department, Oxford, to Dr. C. Anderson for lending me material from the Australian Museum, Sydney, and Dr. H. M. Hale from the South Australian Museum, Adelaide.

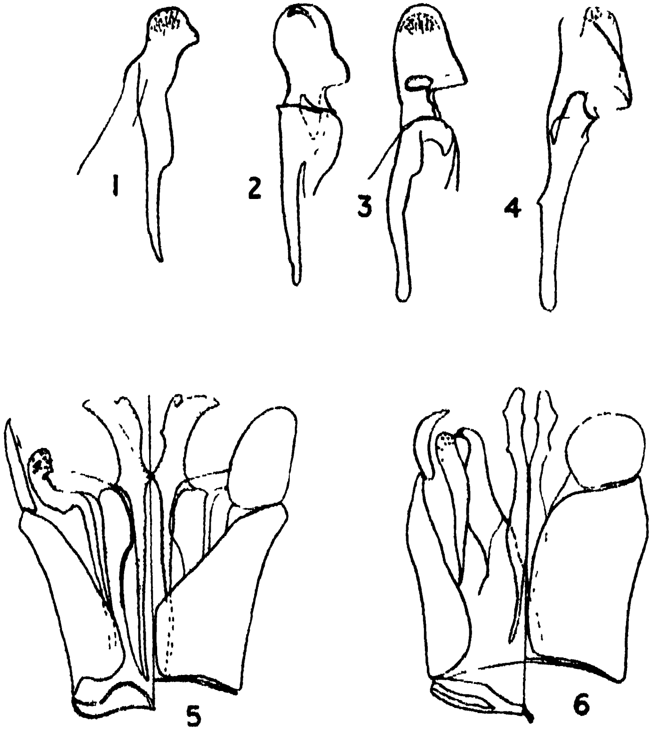
Table of Genera and Species.

A. Abdomen dull above with dense transverse reticulate-rugulose sculpture; hind basitarsus shorter than the next 2 tarsal segments together; head and thorax with large coarse punctures;

mouth-parts normal, tongue shorter than length of head .... *Styphelarge*, gen. nov.

Type *Trichorhachus* [*abdominalis* W. F. Kirby, 1882.

[The single known species (Kirby, 1882, plate iii. fig. 5) is black with the following parts yellow: labrum, tibiæ (except apex of hind pair), tarsi, segments 4–8 of abdomen entirely below



Penis valve of:—(1) *Styphelarge abdominalis* (W. F. Kirby) gen. nov.; (2) *Trichorhachis australis* (Westwood); (3) *T. nitidus* W. F. Kirby; (4) *T. hyalinus* W. F. Kirby.

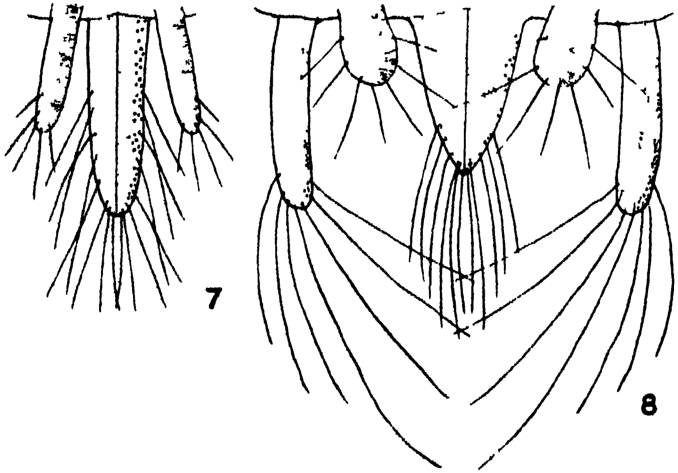
Male genitalia in:—(5) *Trichorhachus australis* (Westwood); (6) *Styphelarge abdominalis* (W. F. Kirby).

and at their edges above. Wings hyaline, stigma and venation piceous. Basal vein in fore wing joins subcosta at a distance from the cubital about as great as the length of the 1st transverse cubital vein; distance between hind ocelli about the same as the distance of an ocellus to the back of the head; ♂ genitalia, figs. 6 and 1; ♀ unknown.]

AA. Abdomen shining with coarse transverse wrinkles; hind basitarsus longer than the next 2 tarsal segments together; head and thorax shining with at most sparse shallow punctures; tongue, when protruded, longer than head . . . . Type *Hylotoma* [(*Schizocera*) *australis* Westwood, 1841 *Trichorhachus* W. F. Kirby, 1882

Species of Trichorhachus *W. F. Kirby.*

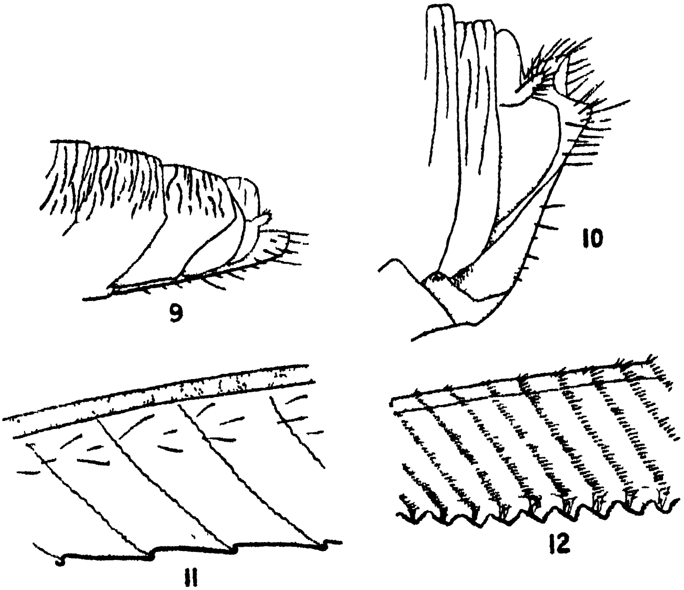
a. Head, thorax, and underside of abdomen metallic green, upperside of abdomen metallic blue; face, antenna, inner and outer orbits, temples, legs except coxæ and trochanters, tegula and stigma of fore wings and apical segment of abdomen (in ♀ also pronotum) yellow. Wings hyaline; basal vein joins subcosta of fore wing at a distance from the cubitus scarcely ⅓ the length of the 1st transverse cubital; flagellum of ♀ antenna not greater than the distance between the eyes in front and thinner than scape; head and thorax almost impunctate; distance between hind ocelli slightly greater than the distance of an ocellus to the back of the head; ♀ sawsheath laterally flattened, not bifid at the apex below (figs. 7 and 9). ♀ saw with 14 teeth, see fig. 11; ♂ genitalia much as in *T. australis* Westwood (fig. 5), but that



Sawsheath from above in: (7) *Trichorhachus nitidus* W. F. Kirby (8) *T. australis* (Westwood).

the penis value is as in fig. 3. This species was figured by Kirby, 1882, pl. iii. figs. 1 & 2. .... ♂♀ *nitidus* W. F. Kirby, [1882.

aa. Bright metallic-blue with the following parts yellow: the face including sometimes the antennæ, the inner and outer orbits, temples, and more or less the joints between the segments of the legs and undersides of tibiæ, the last tergum in ♀ and hypopygium in ♂. Wings with the apical ½ infuscate and the basal ½ hyaline; stigma and venation black; basal vein joins subcosta of fore wing at a distance from the cubitus almost as great as the length of the 1st transverse cubital; flagellum of ♀ antennæ greater than the distance between the eyes in front and broader than scape; head and mesonotum sparsely but definitely punctured; distance between hind ocelli in ♀ slightly greater than the distance of one ocellus to the back of the head, in ♂ about 1½ times as great; ♀ sawsheath bifid below (figs. 8 and 10); ♀ saw with



Sawsheath and apex of abdomen, from the left in :—(9) *Trichorhachus nitidus* W. F. Kirby; (10) *T. australis* (Westwood). Portion of saw in :—(11) *T. nitidus* W. F. Kirby, to include teeth 8 to 12 from apex; (12) *T. australis* (Westwood) to include teeth 8 to 16 from apex.

hair-bands and about 27 teeth bearing smaller denticulations (fig. 12); ♂ genitalia (fig. 5) and penis valve (fig. 2). The species was figured by Westwood, 1841, pl. vii. fig. 2 and Kirby 1882, pl. iii. fig. 3 .... ♂♀ (= *sobrinus* W. F. [Kirby, 1882, *new synonomy*) *australis* (Westwood, 1841).

aaa. Male differs from *T. australis* (Westwood) only in the following characters: the wings are entirely hyaline, the mesonotum is unpunctured and the penis valve is as shown in fig. 4. The ♀ is unknown, but probably agrees closely with that of *T. australis* (Westwood).
The species was figured by Kirby 1882, pl. iii. fig. 4 .... ♂ *hyalinus* W. F. [Kirby, 1882.

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XIII.—*Asiatic Species of* Microphanurus (*Hym., Proctotrupoidea*).

By G. E. J. NIXON, B.A., Imperial Institute of Entomology.

APART from two species from the Seychelles, which he includes in the same region, Kieffer records in his monograph of the Scelionidæ (1926) only one species of *Microphanurus* as Asiatic; this is *M. catacanthæ* Ashm. There has since been described only one further Asiatic species in the genus, *M. painei* Ferrière, from the Solomons. On the other hand, Dodd has described many Australian species of *Telenomus*, some of which Kieffer, correctly in my opinion, has transferred to *Microphanurus*. It is probable that in so wide a ranging genus as this there will be among these Australian forms species identical with some of those I deal with in this paper.

Two Indian species placed by Dodd (1920) in *Telenomus* are here transferred to *Microphanurus*. They are *T. barrowi* Dodd and *T. carinifrons* Cameron.

The types of all new species are in the British Museum.

Subfamily *TELENOMINÆ*.

MICROPHANURUS.

Key to Species (♀♀).

1. Front and middle coxæ contiguous, the mesosternum having no free surface between them. (Sp. with the vertex evenly rounded from the anterior ocellus to the occipital margin; stigmalis very short; mesonotum very characteristically sculptured, being evenly and closely reticulated without indication of punctures.) .... 2. *striaticeps* Dodd.

Front and middle coxæ widely separated, the mesosternum between them having a free, though short, surface......... 2.

2. Mesonotum posteriorly with, short sharply defined notauli. (Spp. with the frons distinctly bulging between the antennal insertions and the lower inner margin of the eye; vertex immediately behind the ocelli with a sharp, almost completely differentiated ridge; mandibles small, bidentate; longitudinal impression of mesopleura not margined below in front.) .... 3.

Mesonotum posteriorly without notauli. 4.

3. Mesonotum and scutellum dull, having an extremely fine, even sculpture .... 5. *vindicius*, sp. n.

Mesonotum on about posterior half and scutellum all over, shining, unsculptured............................ 4. *trophonius*, sp. n.

4. Sculpture of mesonotum very fine, that is, closely and evenly scaly-reticulate with indications of weak punctures. (Sp. with funicle 1 only about 1½ times as long as wide apically; 2 transverse; frons without a bulge between the antennal insertions and the lower inner margin of the eye.)......................... 3. *sulmo*, sp. n.

Sculpture of mesonotum coarse; if fine, as above, then the frons has a bulge between the antennal insertions and the lower inner margin of the eye and the vertex has a completely differentiated smooth ridge .... 5.

5. Vertex immediately behind the posterior ocelli with a clearly differentiated, smooth margin, which passes *behind* the posterior ocelli and joins up with the post-orbital carina; behind this ridge the vertex has a sculpture markedly different from that immediately in front of it, being very shining and nearly smooth .... 6.

Vertex immediately behind the ocelli without such a margin, at most very sharply angled here, and then the resulting ridge joins the posterior ocelli instead of passing *behind* them, and the sculpture of the posterior part of the vertex is not markedly different from that of the anterior part ....

6. Frons in greater part smooth and shining, with at most a feeble scaly-reticulate sculpture against the eye-margins. (Sp. with funicle 1 less than twice as long as its apical width; frons with a conspicuous bulge between the antennal insertions and the lower inner margin of the eye.)............ 1. *seychellensis* Kieffer.

Frons sculptured all over .... 7.

7. Frons without bulges; sculpture of frons, especially in the region of the anterior ocellus, close and fine; vertex unusually sharply, almost perpendicularly, cut away behind the margin; longitudinal impression of mesopleuræ margined in front as far as the coxæ; funicle 1 only about twice as long as its apical width .... 9. *stoicus*, sp. n.

Frons with bulges; sculpture of frons coarse, with strong rugæ within the impression and large, fairly sharply defined punctures elsewhere; longitudinal impression of mesopleura not margined below in front; funicle 1 nearly four times as long as its apical width; vertex less sharply cut away . 10. *barrowi* Dodd.

8. Radicle of antenna nearly half as long as the scape, about 5 : 12. (Strongly sculptured sp., the frons above the antennal insertions with a central irregular keel and with strong transverse rugæ on either side of it; elsewhere the frons is coarsely reticulate-rugose overlaid with a fine scaly-reticulate surface and with no indication of punctures.) .... 11. *carinifrons* Cameron.

Radicle of antenna at most nearly one-third the length of the scape. (Spp. without frontal bulges; mesopleural impression completely margined in front right down as far as the middle coxæ.) .... 9.

9. Vertex very sharply angled between the posterior ocelli, the resulting ridge joining them; mandibles of usual form, feebly 3-toothed, their curvature forming with the cheeks an unbroken line. (Sp. with the sculpture between the ocelli, *i. e.*, anterior to the angle of the vertex, very fine; mesonotum, roughly on posterior half, somewhat coarsely longitudinally rugose.) . 6. *artabazus*, sp. n.

Vertex without such a sharp angulation, showing no trace of a ridge either between or immediately behind the posterior ocelli; mandibles large, clearly widened towards apex and provided with three strong, sharply pointed teeth .... 10.

10. Scutellum (except for the normal crenate, posterior margin) evenly striate-reticulate all over; head behind the eyes and the gonal sulcus, smoothly, obliquely striate. (Sp. with the mandibles projecting well away from the head, so that in a front view of the latter their curvature does not, by any means, form with the cheeks an unbroken line.) .... 8. *painei* Ferrière.

Scutellum roughly divided into a very coarsely rugoso-reticulate and somewhat raised anterior half and a less strongly sculptured, somewhat concave posterior half; head behind the eyes and the gonal sulcus more or less closely scaly-reticulate. (Mandibles not projecting so much away from the head as in *painei*.) .... 7. *priapus*, sp. n.

1. *Microphanurus seychellensis* Kieffer. (Fig. 4, *g*.)

Microphanurus seychellensis Kieffer, Nixon, 1935, Trans. R. Ent. Soc. London, lxxxiii. p. 97.

CEYLON (Passara), *J. C. Hutson*: series bred July 1929 from eggs of *Cantheconidea robusta* Dist.

I can find no difference between this series and the numerous African examples of *seychellensis* that I have examined. The species is widely distributed in Africa, ranging from Abyssinia through Uganda to Cape Province. I have recorded it from the following hosts:—*Antestia orbitalis* Westw. (=*variegata* Thunb.); *Antestia orbitalis* var. *lineaticollis* Stål; *Agonoscelis pubescens* Thunb. (=*versicolor* Fabr.).

2. *Microphanurus striaticeps* Dodd.

Microphanurus striaticeps (Dodd) Nixon, 1935, Trans. R. ent. Soc. London, lxxxiii. p. 100.

PUNJAB (Lyallpur), *U. Bahadur*: 3 ♀♀, 1 ♂, bred from eggs of Pentatomid on leaf of Brinjal, *Solanum Melanogena* L.

So far known only from Africa, where I have recorded it from Nyasaland; Brit. Sudan (bred from eggs of *Acanthomia brevirostris* Stål); Nigeria; Cape Province.

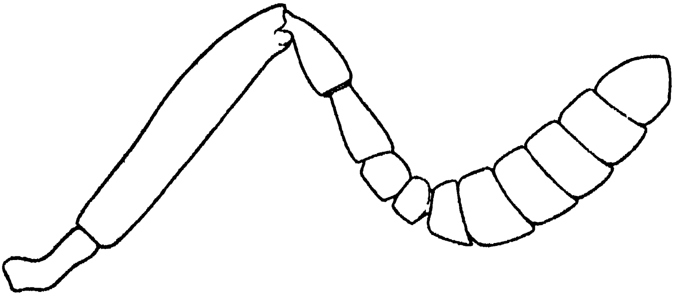
In my revision of the African Telenominæ (1935), I failed to mention the important feature in the structure of the mesosternum, given in the key in this paper. When the already described genera of the Telenominæ come to be known more thoroughly it may be necessary to make a new genus for *striaticeps* Dodd.

3. *Microphanurus sulmo*, sp. n.

♀.—Black. Legs, except coxæ, ochreous yellow. Radicle of antennæ dark brown, nearly black; scape a little less bright in colour than the legs; pedicel and first three segments of the funicle brown, paler than the club.

Head strongly transverse, clearly wider than the thorax, about 7 : 6 (fig. 3, *d*). Frons weakly but evenly convex. No bulge between the antennal insertions and the lower inner margin of the eye; hence no supra-antennal impression. Frons above the antennæ (roughly lower half), with delicate, transverse, wavy striations; elsewhere dull, finely, evenly, closely scaly-reticulate with indication of very feebly defined punctures; in the region immediately in front of the anterior ocellus the sculpture becomes somewhat weaker, and the surface in consequence less dull. Vertex sharply angled between the ocelli, its sculpture between them similar to that of the frons; that of its posterior (declivous) surface hardly different. Shortest distance between the eyes compared with their width, as seen from above, as 3 : 2. Back of the head between the temples and the mandibles dull, evenly scaly-reticulate. Antenna (fig. 1); radicle about one-third as long as the scape; funicle 1 about one and a half times as long as its apical width; 2 transverse,

Fig. 1.



Antenna of *M. sulmo*, sp. n., ♀.

Thorax raised high above the abdomen, much as in *vindicius*, sp. n. (*cf.* fig. 2, *f*). Mesonotum feebly shining, with a fine even sculpture, similar to that of the upper part of the frons, but a little less strong. Scutellum over its greater medial part, strongly shining and virtually smooth. Postscutellum with the usual, strongly transverse, delimited area, which is evenly longitudinally costate. Mesopleural depression smooth and shining; its posterior margin with a row of pits which is obliterated just below middle; the depression is not margined on its lower half in front. Metapleura over their greater surface flat, smooth, and shining. Legs somewhat short. Fore wings decidedly darkened; stigmalis short for the genus.

Abdomen exactly as long as wide (fig. 4, *i*). Tergite 1 very strongly transverse; its striations tending to break up on apical half; 2 striated almost to apex.

Length, ♀, ·9 mm.

CEYLON (Talawakolle), *C. B. R. King*: 7 ♀♀ bred 1932 from eggs of a Pentatomid bug *Cantheconidea robusta* Dist.

This species seems to be largely characterized by the shortness of the basal funicular segments, lack of frontal bulges, fine, even sculpture of mesonotum and short stigmalis. It is quite distinct from the other species I am dealing with in this paper. Nor is it like any African species of *Microphanurus* that I have described.

4. *Microphanurus trophonius*, sp. n.

♀.—Black. Legs brownish yellow. Scape of antennæ infuscated on apical half.

Head (fig. 3, *g*): Frons without a depression above the antennal insertions, almost everywhere predominantly smooth and shining, there is an indication of feeble, irregularly arranged, transverse striations, but on the central part of the frons these are virtually absent; between the lower, inner margin of the eye and the antennal insertions (on the swollen part) there is a patch of scaly-reticulate sculpture. To the sides of the anterior ocellus the surface is scaly-reticulate with a few ill-defined punctures. Head cut away at right angles behind the eyes. Vertex immediately behind the ocelli with a sharp, almost completely differentiated ridge; surface posterior to the ridge very shining, in greater part smooth. Antennæ: funicle 1 slightly longer than the pedicel, about twice as long as apically wide; 2 as long as wide; club strongly narrowed to apex, the apical segment only about three-fifths as wide as the penultimate.

Thorax as in *vindicius*, sp. n. (*cf.* fig. 2, *f*). Mesonotum shining, very irregularly punctured, almost rugose, without a fine surface sculpture, such as is characteristic of *vindicius*; after about middle, the sculpture fades out altogether, leaving a highly polished surface, smooth save for scattered, minute, setiferous punctures. Notauli deep and very conspicuous, extending over slightly more than half their possible length. Scutellum smooth except for the foveate posterior margin. Postscutellum showing as an evenly foveate furrow and without rugulosities posterior to the foveæ, the surface falling away very sharply. Mesopleural depression smooth except for a row of foveæ along its posterior margin; the depression is not margined in front below. Metapleura without any flat surface, being much intersected by raised ridges and rugæ. Fore wings with a brownish tint; venation pale brown, sharply defined. *Abdomen* of same shape as *sulmo*, sp. n. (*cf* fig. 4, *i*); as wide as the thorax without tegulæ. Tergite 1 evenly striated, the spaces between the ridges smooth; 2 striated nearly to apex.

Length: ♀, about 1 mm.

SUMATRA (Asahan), *F. Schneider*: 3 ♀♀, bred 1934–36 from eggs of a Hemipteron, "Raubwanze," probably Reduviidæ on *Uncaria Gambir* Roxb.

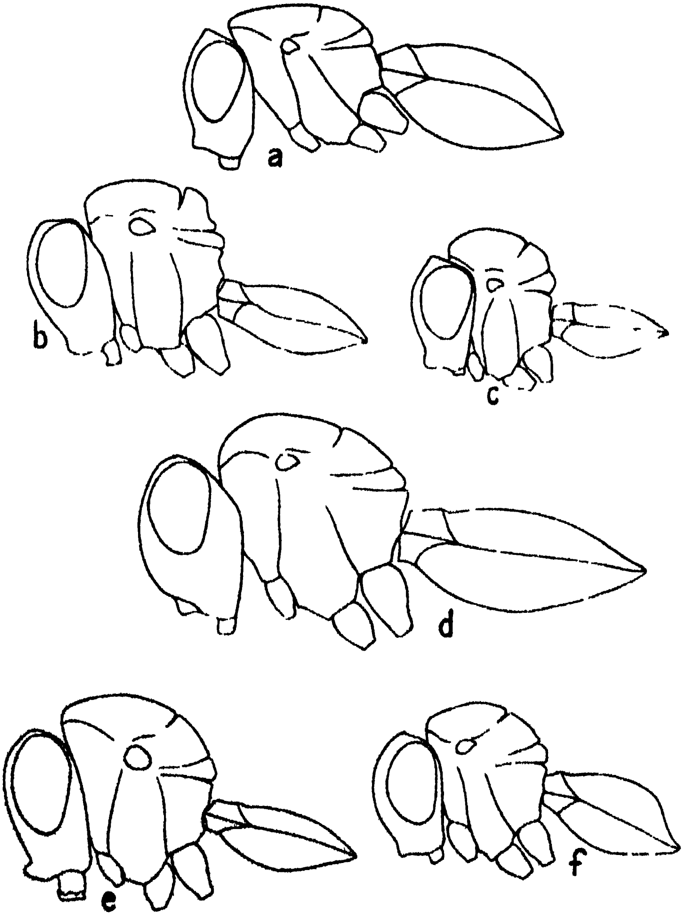
This is one of the most distinctive looking Microphanuri that I have ever seen. It is characterized essentially by the polished posterior part of the mesonotum combined with the strong notauli.

5. *Microphanurus vindicius*, sp. n. (Fig. 2, *f*.)

♀.—Black. Legs, except coxæ, radicle, and scape of antennæ dull honey-yellow (the lack of brightness in the colour may be due to the insects having been in spirit); pedicel and first three segments of the funicle darker than the scape.

Head (fig. 4, *a*): Frons feebly bulging between the lower, inner margin of the eye and the antennal insertions, hardly with a depression above the antennæ and here with only a simple scaly-reticulate sculpture, the meshes of which tend to be larger than elsewhere. Along the inner eye-margins, right up as far as the posterior ocelli, there is the usual indication of punctures, but they are very ill-defined and weak and by no means as close as

Fig. 2.



Body (lateral) of :—a, *M. artabazus*, sp. n., ♀; b, *M. priapus*, sp. n., ♀; c, *M. stoicus*, sp. n., ♀; d, *M. barr* [illegible] Ferrière, ♀; f, *M. vindicius*, sp. n., ♀.

possible; generally speaking, the predominating sculpture of the frons and vertex is one of scaly-reticulation. Vertex sharply angled immediately behind the posterior ocelli but without a differentiated ridge; surface of posterior (declivous) part with a scaly-reticulate sculpture hardly different from that of the frons. Shortest distance between the eyes on the frons not much greater than their width as seen from above, about 11 : 9. Antennæ: radicle only about one-fifth as long as the scape; funicle 1 about twice as long as apically wide; 2 clearly a little longer than wide. Back of head between the temples and the mandibles somewhat feebly scaly-reticulate.

Thorax raised less high above the level of the abdomen than in *stoicus*, sp. n., for example. Mesonotum a little flattened on its anterior half, its sculpture essentially like that of the frons and the vertex, but considerably closer, the punctures less in evidence; at first sight the sculpture appears finely shagreened. Notauli present posteriorly, short, but well defined. Scutellum sculptured all over, but more finely so than the mesonotum. Postscutellum with the usual longitudinally costate delimited area. Mesopleural depression not margined below in front and with a row of pits along its entire posterior border. Metapleura in greater part intersected by much raised ridges and rugæ; on its upper half there is a small, flat, shining space. Fore wings: marginalis of normal length for the genus.

Abdomen very slightly longer than wide when the segments are not retracted, about 10 : 9. Tergite 2 obviously transverse, 12 : 7, striated almost to apex, but the striæ somewhat weak.

Length, ♀, 1·2 mm. approx.

JAVA (Mt. Salak, near Buitenzorg), *J. S. Philipps*: 3 ♀♀ bred, Sept. 1937, from eggs, probably hemipterous, found at 2000 ft. (Wonogiri Dist., 2000 ft. *Type-loc.*). *J. S. P.*: 4 ♀♀, bred 1937, from eggs of *Dasynus manihotis* Blöte.

This species is characterized, among the Asiatic species that I know, by the comparatively fine sculpture of the mesonotum in combination with the short notauli. On the other hand, it is very similar to two species known so far only from S. Africa ; these are *Microphanurus maro* Nixon (1935) and *M. enceladus* Nixon (1935). *M. vindicius* differs from *maro* in lacking a differentiated vertical margin, though it resembles it very closely in sculpture ; from *enceladus* it differs in having funicle 1 distinctly shorter, the head more transverse, with the vertex less scooped out behind and the mesonotum without *raised* rugulosities. These three species, together with *Microphanurus menecles* Nixon (1935), another S. African species, clearly belong to the same species-group which is characterized chiefly by the presence of bulges on the frons, short notauli, with sculpture of frons and vertex.

6 *Microphanurus artabazus*, sp. n. (Fig. 2, *a*.)

♀.—Legs (except coxæ) and antennal scape reddish yellow. Radicle of antenna virtually black ; pedicel and first four segments of the funicle slightly darker in colour than the scape.

Head seen along a line perpendicular to a line between the posterior ocelli more than two and a half times as wide as its greatest length, about 23 : 9 (fig. 3, *f*). Frons of normal convexity between the lower inner margin of the eye and the antennal insertions, not at all bulging here ; further, the frons almost everywhere, right up to the anterior ocellus, is very shining and is without a fine surface sculpture but has fairly strong, mostly very irregular, striations which extend as far as the eye margins ; towards the genal sulcus they break up to form raised reticulation which against the sulcus itself merges into close scaly-reticulation. Vertex very sharply angled between the posterior ocelli, the resulting ridge not differentiated ; it meets more or less the middle point of the inner side of each posterior ocellus before curving round behind them to be continuous with the post-orbital carina ; between the ocelli and to the sides of the anterior ocellus the vertex is very finely and closely scaly-reticulate, this sculpture forming a sharp contrast with that of the frons ; posterior (declivous) part of the vertex dull, roughened. Shortest distance between the eyes one and a half times as great as their width as seen from above, about 3 : 2. Antennæ (fig. 3, *c*) : radicle about one-third the length of the scape ; funicle 1 about two and a half times as long as apically wide; 2 slightly longer than wide. Back of head between the temples and the mandibles evenly scaly-reticulate, as in most species.

Thorax not raised conspicuously high above the level of the abdomen (fig. 2, *a*). Mesonotum somewhat flattened, with a well-defined raised sculpture which on posterior half develops into irregular longitudinal striations. Scutellum with irregular longitudinal rugosities which are wider apart than those of the mesonotum. Postscutellum with the usual longitudinally costate delimited area. Mesopleural depression sharply margined in front right down as far as the middle coxæ; the depression tends to be finely transversely striated on its lower half. Metapleura deeply intersected everywhere by much raised ridges and rugæ. Fore wings: stigmalis of normal length.

Abdomen clearly longer than wide, about 5 : 4, when the segments are not retracted; otherwise about as long as wide. Tergite 2 with strong striations medially extending nearly to apex; this segment is broadly smooth on each side.

♂.—Funicle pale brownish yellow; segments 4–9 very slightly longer than wide. Otherwise like the ♀.

Length, ♂♀, 1·35 mm. approx.

MALAYA (Setapak, *Type-loc.*), *G. H. Corbett & B. A. R. Gater*: series of 8 ♀♀, 1 ♂ (Ref. no. 1858), bred 13. x. 1921 from eggs of *Scotinophara* sp. (Hemiptera); (Serdang), *N. C. E. Miller*: 5 ♀♀, bred 14. iv. 1932, from unknown eggs of *Pentatomid* bug.

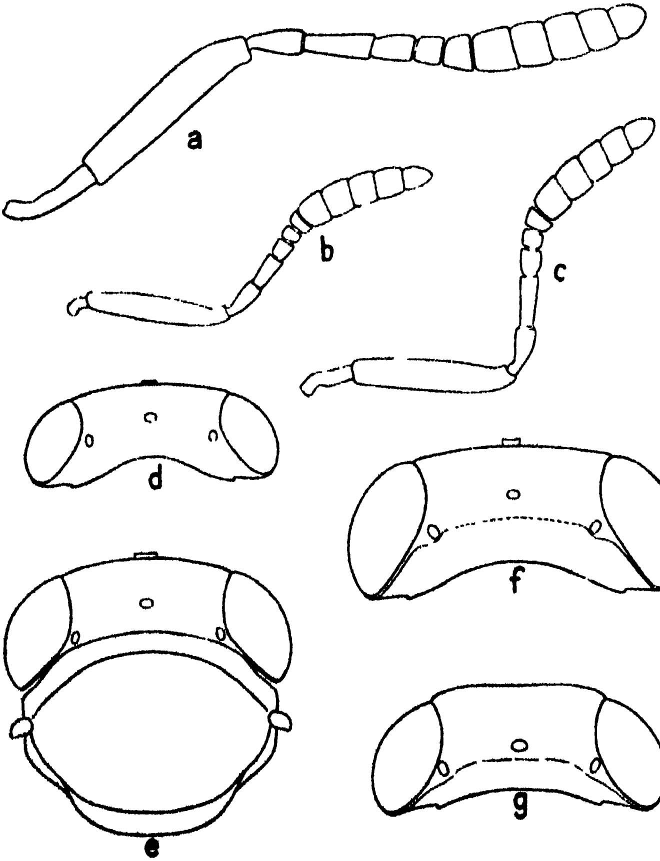
Fig. 2, *a*, shows the abdomen of the female somewhat swollen.

This species is chiefly characterized by the sculpture of the head, when the comparison is restricted to Asiatic forms. It is closely and naturally related to *Microphanurus aloysii-sabaudiæ* Fouts (Nixon, 1935), an African species. In this insect the fine sculpture of the vertex extends well down over the frons; there is no sharp ridge between the ocelli, and the thorax is less flattened; its mandibles, too, are larger with the teeth more distinct than in *artabazus*. The close relationship between the two species rests on facies, sculpture, and long radicle of the antenna.

7. *Microphanurus priapus*, sp. n. (Fig. 2, *b*.)

♀.—Black. Legs (except coxæ, which are black), radicle of antenna, scape, pedicel, and first four segments of the funicle somewhat deep reddish yellow.

Fig. 3.



a, *M. carinifrons* Cam., antenna of ♀; b, *M. stoicus*, sp. n., antenna of ♀; c, *M. artabazus*, sp. n., antenna of ♀; d, *M. sulmo*, sp. n., head of ♀ (from above); e, *M. stoicus*, sp. n., head and thorax of ♀ (thorax somewhat foreshortened); f, *M. artabazus*, sp. n., head of ♀ (from above); g, *M. trophonius*, sp. n., head of ♀ (from above).

Head (fig. 4, *c*): Frons not in the least bulging between the antennal insertions and the lower inner margin of the eye; above the antennæ its surface *tends* to be transversely striate, elsewhere very irregularly reticulate; immediately in front of the anterior ocellus the sculpture tends to fade out altogether leaving the surface smooth and shining. Vertex more or less evenly rounded from in front to behind; between the ocelli more closely and more regularly sculptured than on the frons, rugose-reticulate. Shortest distance between the eyes compared with their width, as seen from above, as 4 : 3. Antennæ: radicle about one-fifth as long as the scape; funicle 1 about twice as long as its apical width; 2 distinctly longer than wide. Genal sulcus sharply margined behind, the resulting ridge being a continuation of the post-orbital carina; in front of this ridge is another, less strong and parallel to it, so that the genal sulcus appears as a flat-bottomed crenate furrow; a third carina is present, extending upwards from the posterior basal corner of the mandible and fading out at about the lowest point of the eye; surface of head behind this ridge more or less scaly-reticulate.

Thorax (fig. 2, *b*).—Mesonotum coarsely and strongly sculptured; over its greater part it is covered with raised irregular rugosities; anteriorly this sculpture tends to break up into single raised points; posteriorly it develops into very short longitudinal rugæ. Scutellum slightly raised above the posterior level of the mesonotum, very coarsely rugose-reticulate on its anterior half, posteriorly slightly hollowed out, its sculpture less raised here; posterior crenate furrow less sharply contrasted than in most species. Mesopleural depression sharply margined in front right down as far as the middle coxæ; the depression itself is transversely ribbed along its more or less entire middle length. Metapleura completely intersected by raised ridges and rugæ. Fore wings: stigmalis of normal length.

Abdomen hardly longer than wide, 10 : 9. Tergite 2 very distinctly transverse, strongly, longitudinally striated all over but with a smooth apical band.

Length, ♀, 1·3 mm.

JAVA (Buitenzorg, *Type-loc.*), *J. S. Philipps*: 11 ♀♀ (Ref. C**), bred 1937 from eggs of *Chrysocoris atricapillus* Guér. (Pentatomidæ); (Wonogiri Dist., 2000 ft.), *J. S. P.*: 3 ♀♀, bred 1937 in company with *Microphanurus vindicius*, sp. n., from eggs of *Dasynus manihotis* Blöte.

This species is chiefly characterized by the coarse sculpture of the head and of the thorax and by the peculiar arrangement of sculpture on the scutellum. It is more closely related to *painei* Ferrière than to any other species mentioned in this paper. In my key to the African species (1935) it would run to *orontes* Nixon (S. Africa, Port St. John), to which it seems to be closely related and from which it differs chiefly in sculpture of vertex and scutellum.

8. *Microphanurus painei* Ferrière. (Fig. 2, *e*.)

Microphanurus painei F. 1933, *Stylops*, II. p. 108.

This distinct little species is characterized as follows :-

Radicle of antenna black, about one-fourth the length of the pale yellow scape.

Head (fig. 4, *d*) : Frons without a trace of frontal bulges and without an impression above the antennæ, where it is strongly transversely striated away from a very ill-defined central ridge ; this striate central area extends nearly to the anterior ocellus ; elsewhere the frons is evenly rugose-reticulate overlaid with a feeble scaly-reticulate sculpture. Vertex without a trace of a ridge, the sculpture of the frons merging imperceptibly into that of the posterior (declivous) part of the vertex.

Thorax (fig. 2, *e*) very strongly raised above the level of the abdomen and appearing unusually large in proportion to it. Posterior row of foveæ of the mesopleural depression extended to form deep transverse pits which reach virtually to the mid-line of the depression.

Abdomen not longer than wide. Striations of tergite 2 more or less obliterated and restricted to base of segment.

For other notes, see key.

Length, ♂♀, 1·25 mm. approx.

SOLOMONS : ex eggs of *Axiagastus campbelli* Dist. (Pentatomidæ).

Lever (1933) has given notes on the oviposition of this species.

9. *Microphanurus stoicus*, sp. n. (Fig. 2, *c*.)

♀.—Black. Legs, except coxæ, pale honey-yellow. Radicle of antenna, scape, pedicel, and first four segments of the funicle more or less the same colour as the legs.

Head seen from above very strongly transverse, markedly crescentic, fitting unusually closely, like a cap, on to the thorax. Frons without bulges between the antennal insertions and the lower inner margin of the eye; above the antennæ a little flattened, much more shining than elsewhere, and with fine, irregular, transverse striations; about half way towards the anterior ocellus and towards the eye margins, the striations fade out and merge into the predominating sculpture of the head; this is dull and consists of almost contiguous, even, but very ill-defined punctures, the spaces between them finely scratched; it must be emphasized that this sculpture is merely a distinctive combination of the two usual types of sculpture, *i. e.*, ill-defined punctures and scaly-reticulation. Shortest distance between the eyes compared with their width, as seen from above, as 21 : 16. Vertex immediately behind the posterior ocelli sharply margined, the resulting ridge completely differentiated and smooth; behind the ridge the vertex is smooth and falls away perpendicularly to the occipital foramen. Antennæ (fig. 3, *b*): radicle many times shorter than the scape; funicle 1 about twice as long as apically wide. Back of head between temples and mandibles entirely smooth and shining.

Thorax raised high above the level of the abdomen (figs. 2, *c*, & 3, *e*). Mesonotum closely and evenly reticulated. Scutellum sculptured slightly more coarsely than the mesonotum. Post-scutellum with the usual transverse delimited area, which is longitudinally costate. Mesopleural depression transversely costate along its entire middle length; further, the furrow is sharply margined anteriorly right down as far as the middle coxæ. Metapleura without any flat surface, being irregularly cut up by much raised ridges and rugæ. Fore wings almost hyaline; venation almost colourless; stigmalis somewhat short.

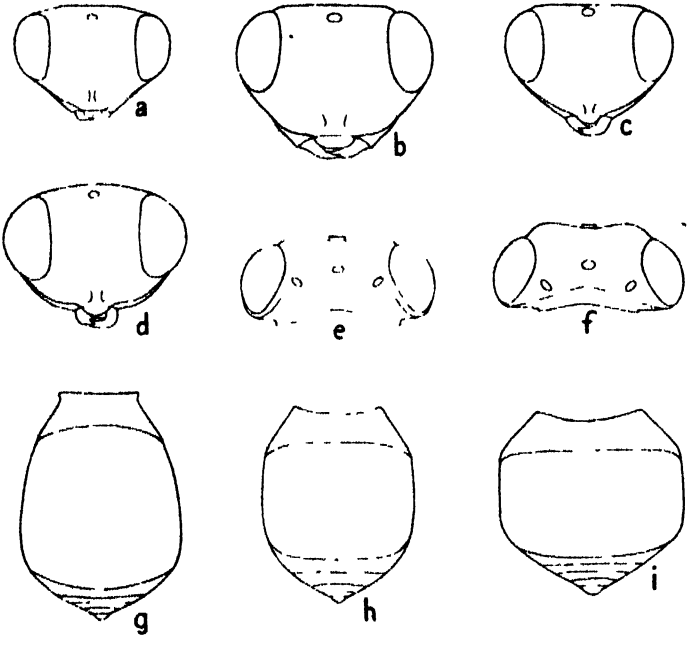
Abdomen almost exactly as long as wide when the segments are not retracted. Tergites 1 and 2, both in shape and sculpture, like *sulmo*, sp. n., though the striations on tergite 1 tend to be a little stronger than in that species.

Length, ♀ ·95 mm.

Malaya (Pahang), *G. H. Corbett*: 6 ♀♀ (Ref. no. 8720), bred 16. vi. 1932, from eggs of a Hemipteron.

This stout little species is characterized by shape of head, combined with sculpture of frons, vertex, and mesonotum. It should be emphasized that the sculpture of the head is essentially different from that of the mesonotum.

Fig. 4.



a, *M. vindicius*, sp. n., head of ♀ (from in front); b, *M. carinifrons* Cam., head of ♀ (from in front); c, *M. priapus*, sp. n., head of ♀ (from in front); d, *M. painei* Ferrière, head of ♀ (from in front); e, *M. carinifrons* Cam., head of ♀ (from above); f, *M. barrowi* Dodd, head of ♀ (from above); g, *M. seychellensis* Kieffer, abdomen of ♀; h, *M. carinifrons* Cam., abdomen of ♀; i, *M. sulmo*, sp. n., abdomen of ♀.

10. *Microphanurus barrowi* Dodd. (Fig. 2, *d*.)

Telenomus barrowi Dodd, 1920, Trans. R. Ent. Soc. Lond. p. 356.

♀.—Apart from the characters given in the key, this species may be further diagnosed as follows:—

Black. Radicle of the antenna yellowish; scape darkened except at base. All the femora slightly infuscated.

Head (fig. 4, *f*): Frons, apart from the medial impression, characteristically and strongly punctured, the punctures separated by about their own diameter; at least on middle and lower part of the frons there is very little scaly-reticulate sculpture between the punctures, the surface being almost smooth and unsculptured. Funicle 1 much longer than the pedicel, slender, about four times as long as apically wide; 2 nearly twice as long as wide. Sculpture of mesonotum somewhat fine for the size of the insect, but raised and showing a feeble longitudinal tendency. Mesopleural depression completely smooth, not margined in front below.

Length, ♀, 2 mm. Type in British Museum.

N.W. INDIA (Dalhousie): 1 ♀ bred from egg of a Sphingid.

11. *Microphanurus carinifrons* Cameron.

Immsia carinifrons Cam 1913, Ind. For. Rec. iv p. 105
Telenomus carinifrons Cam., Dodd, 1920, Trans. R Ent Soc. Lond. p. 355

♀.—In addition to the diagnosis given in the key, the following notes will assist in the identification of this species:—

Radicle of the antenna black; scape yellow.

Head (fig. 4, *b*, *e*): Frons not at all bulging between the antennal insertions and the lower inner margin of the eye. Mandibles large, with three very short ill-defined teeth. Antenna (fig. 3, *a*). Vertex between the posterior ocelli without a trace of a ridge, merely somewhat abruptly angled here. Mesopleural depression sharply margined in front, right down as far as the middle coxæ; the depression itself with feeble curved striations. Abdomen (fig. 4, *h*).

Length, ♀, 1·9 mm. approx. Type in British Museum.

UNITED PROVINCES (Dehra Dun).

The distinctive feature of this species is the very long black radicle of the antenna.

List of Hosts of Microphanurus *mentioned.*

HEMIPTERA.

Acanthomia brevirostris Stål (Cor.)	*M. striaticeps* Dodd.
Agonoscelis pubescens Thunb. (=*versicolor* Fabr.) (Pent)	*M. seychellensis* Kieffer.
Antestia orbitalis Westw. (=*variegata* Thunb.) (Pent.)	*M. seychellensis* Kieffer.
A. orbitalis var. *lineaticollis* Stål	*M. seychellensis* Kieffer.
Axiagastus campbelli Dist. (Pent.)	*M. painei* Ferrière.

Cantheconidea robusta Dist. (Pent.)	*M. sulmo*, sp. n. *M. seychellensis* Kieffer.
Chrysocoris atricapillus Guér. (Pent.)	*M. priapus*, sp. n.
Dasynus manihotis Blote (Cor.)	*M. vindicius*, sp. n. *M. priapus*, sp. n.
Reduviidæ, sp. ?	*M. trophonius*, sp. n.
Scotinophara sp. (Pent.)	*M. artabazus*, sp. n.

LEPIDOPTERA.

Sphingidæ, sp. ?	*M. barrowi* Dodd.

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XIV.—*Balanophyllias from the Cape of Good Hope.*

By C. J. VAN DER HORST, University of the Witwatersrand.

[Plates V. & VI.]

IN 1933 an article of mine describing a new species of *Balanophyllia*, *B. annæ*, from Stil Bay was published in this Journal. Since then Prof. T. A. Stephenson, Cape Town, has sent me some more specimens for identification; they also belong to this genus and are also found in the Cape waters. They were found in two different localities, Agulhas to the east of the Cape of Good Hope and Oudekraal, west of the Cape. They belong to two different species and both also differ from *B. annæ*. As the photograph previously published with the description of the latter species is rather indistinct, I herewith wish to give another photograph of it that will, I hope, enable other students to recognize this species (Pl. V. fig. 1).

The specimens from Agulhas agree with Verrill's description of *B. capensis* from Simon's Bay, which is also to the east of the Cape Peninsula. In my description of *B. annæ* I mentioned that Verrill did not give a figure of *B. capensis*. His description in the Communications read before the Essex Institute (vol. iv. p. 149), it is true, is without a figure, but his description in the 'Proceedings of the Essex Institute' (vol. iv. p. 28) is accompanied by three figures, which, however, are not very clear and are of no great value in recognizing the species.

Balanophyllia capensis Verrill.

(Pl. VI. figs. 1–6.)

The base of the coral spreads out as a layer over the substratum; of the six specimens available two were attached by a common base. From this basal plate the coral rises up, at first rather narrow, but gradually increasing in diameter towards the calicular margin. The outside is covered by a dense epitheca, through which no trace of the ribs is visible; the epitheca may stop at a distance of about 2 mm. from the margin, or it may be continued higher up, so that only the exsert septa project above it. According to Verrill the wall above the epitheca is very porous and openly granular with deep intercostal furrows. I have been unable to observe that the wall is any more porous than it usually is in *Balanophyllia*; in one specimen hardly any pores are visible. The ribs are all nearly equal in breadth and broader than the intercostal furrows, which, though well indicated, are not deep; the ribs are covered with granules, which do not form a regular row in the middle, but are scattered over the surface of the rib. There are rather more than two ribs in 1 mm., about seven occurring in 3 mm.

Just above the spreading base the diameter of the coral is 5·8 × 6·2 mm. and near the calicular margin 7 × 8 mm.; in another specimen these measurements are 4·8 × 4·8 and 7 × 9·4 mm. respectively. The total height of the first specimen is 10·3 mm.; of the second specimen the base was broken off, its present height is 12·2 mm., so that, if complete, it might have been about 13 mm. high. The calicle is deep, as Verrill remarks, though I do not find it more than half the greater diameter; the depth of the two measured specimens is nearly 4 mm.

The septa are regularly arranged in six systems of four cycles. The primaries and secondaries, which do not show a great difference in size, never fuse with the columella. This was clearly shown in one specimen, the base of which was ground off. This same specimen also revealed that a new wall had been formed three times; inside the inner and oldest wall only the primary and what will later become the quaternary septa are present; within the second wall the secondary septa are added and, finally, within the outer wall the tertiary septa appear; but all these septa reach the base of the coral (Pl. VI. fig. 2). The primary septa are exsert up to 1 mm., the secondaries are slightly less exsert than the primaries, and the tertiaries are the lowest of all. The primary, secondary, and tertiary septa have the same general form; they are thin along their free inner edge, thinner than the interseptal spaces, and they become gradually thicker towards the wall, where they are much thicker than the interseptal spaces; they have some irregularly formed teeth on the rather narrow top; from here they slope down and then, still some distance above the surface of the columella, they fall down perpendicularly (text-fig. 1). This is at least so in the primary and secondary septa, the tertiaries are too narrow and fall down directly from the top. The top part of the primaries and secondaries is granulated and porous; the sloping part shows fine striæ on the faces perpendicular to the free edge and corresponding to fine teeth along that edge;

Text-fig. 1.

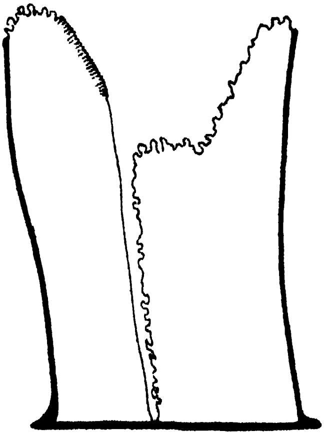

Diagram of a longitudinal section of the calicle of *Balanophyllia capensis*, showing a primary septum on the left and a quaternary attached to the columella on the right-hand side.

the perpendicular part has an entire edge or shows some undulations. The septa of the fourth cycle are, as Verrill describes them, well developed, very thin and porous with jagged edges; the two in each half system meet and fuse in front of the tertiary septa; those of each system may reach the columella independently, or they may fuse just where they reach the columella. The columella, formed by the twisted and fused inner edges of the quaternaries, consists of twisted and rather thick lamellæ, covered with granules; its surface is flat; in all specimens it has nearly the same length, 3–3·5 mm., but its breadth varies a good deal; it may be very narrow, about ½ mm., hardly more than a single lamina in the longer axis of the calicle, or it may be up to 2 mm. broad; it is only in the former instance that the quaternaries of each system fuse where they reach the columella (Pl. VI. figs. 3, 4).

According to Verrill the colour of the living polyp is bright vermilion; there are 20 short and blunt tentacles, those of the first cycle being the longest, and the mouth is oblong.

Localities: Simon's Bay (Verrill) and Agulhas, South Africa.

Balanophyllia bonæ spei, sp. n.

(Pl. V. figs. 2–5.)

The coral rises up from an often spreading base, thereby increasing in diameter. The outside is covered by an epitheca, which extends upwards to within 1–2 mm. from the calicular margin. This epitheca shows horizontal striæ and it is not so thick as in *B. capensis*, for the ribs remain visible through it; only in small areas the epitheca may become so thick that the ribs are quite obscured. The wall above the epitheca is very granular and porous, which makes the ribs rather inconspicuous in many places. Most of the ribs are narrow, with a single row of granules; there may be, however, two rows of granules, and these may be irregularly placed; in this case the ribs are broader, and this is independent of their order. But in general all ribs are of the same thickness, narrower than the spaces between them, and there are about two ribs in 1 mm.

The smallest diameter of the coral, somewhat above the spreading base, is 8×8·2 mm.; near the calicular margin the diameter is 9·2 × 11·8 mm. In another specimen these measurements are 7·2 × 8·3 mm. and 9·1 × 11·2 mm.; the calicle therefore is slightly oval. The total height of these specimens is 11 and 12·5 mm. The depth of the calicle is about 4 mm.—that is, relatively less than in *B. capensis*.

The septa are arranged in six systems of four or five cycles. The occurrence of four or five cycles is quite symmetrical in respect to the longitudinal axis of the calicle; in each quarter system next to the directive septa there are five cycles, in the half systems lateral to these there are four cycles, and in the half systems at the sides of the lateral secondary septa there is no fifth cycle between the secondary and tertiary septa, but there is one between the tertiary and the primary septa. In order to obviate the assumption that homologous septa may belong to the fourth cycle in one quarter system and to the fifth cycle in another, it is better to suppose that the septa of the fourth cycle are absent in some quarter systems, in which case there is only one septum of the fifth cycle in such a quarter system, but if the septum of the fourth cycle is present, there is one

Text-fig. 2.

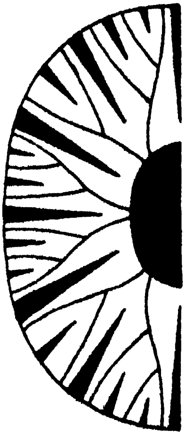

Diagram of the arrangement of the septa of *Balanophyllia bonæ spei*.

of the fifth cycle at each side of it. The arrangement and sequence of the septa are then as indicated in text-fig. 2.

Only the septa of the fifth cycle fuse with the columella; the primaries etc. also remain separated from the columella in the basal part of the coral. Unlike *B. capensis*, *B. bonnæ spei* does not form concentric walls; only one wall is formed which gradually widens out towards the calicular margin.

The primary and secondary septa are slightly exsert, projecting about ½ mm. above the tops of the other septa, which are nearly all on the same level. The primaries, secondaries, and tertiaries have all the same form, except that the primaries are the largest and the tertiaries the smallest of the three. They are very thin near their free inner edge, much thinner than the interseptal spaces; they gradually become thicker towards the wall, where the primaries and secondaries are thicker than the interseptal spaces; the tertiaries, however, are also thinner here. These septa have some irregularly formed teeth on their narrow top; their inner edge is slightly bent, falling steeply down (text-fig. 3). The edge of these

Text-fig. 3.

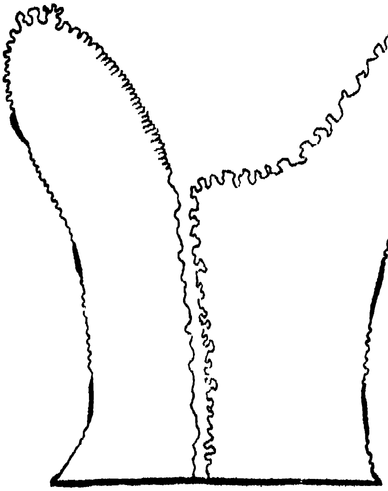

Diagram of a longitudinal section of the calicle of *Balanophyllia bonæ spei*, showing a primary septum on the left and a septum of the fifth cycle attached to the columella on the right-hand side.

septa is sometimes nearly entire, mostly it is provided with small rather regular teeth, corresponding to fine striæ on the face which are perpendicular to the edge; but sometimes those septa show large and irregular teeth along their edge, in which case pores may occur not only near the top of the septa, but also deeper down. The septa of the fourth cycle, when present, are very small, and occur only over a short distance near the calicular margin. The septa of the fifth cycle are thin and porous with jaggedly dentated edges; they fuse pairwise in front of the septa of the fourth, and again in front of those of the third cycle and sometimes also in front of the secondaries, before they reach and fuse with the columella.

The columella is spongy, up to 4·5 mm. long and hardly more than 1 mm. broad; it may be very narrow, forming hardly more than a lamina in the longitudinal axis of the calicle. Its surface is flat.

Locality: Oudekraal, at the west coast of the Cape Peninsula.

This species seems to be nearly related to, may even be identical with, *B. brevis*, described by Duncan from Madeira (Proc. Zool. Soc. 1882). In *B. brevis*, however, the costæ are unequal, whereas in *B. bonæ spei* they are equal, or if there is a slight difference in thickness then this is independent of their order. Furthermore, in *B. brevis* the walls are imperforate and in *B. bonæ spei* they are distinctly perforate. The original specimens of *B. brevis* could not be located, so in view of the differences I thought it better to describe the Oudekraal specimens as a new species.

EXPLANATION OF THE PLATES.

Plate V.

Fig. 1. *Balanophyllia annæ* v. d. Horst. Top view of calicle. × 6

Figs. 2 & 3. *Balanophyllia bonæ spei*, sp. n. Top view of calicle × 5

Figs. 4 & 5. Ditto. Side view of calicle. × 5.

Plate VI.

Balanophyllia capensis Verrill.

Figs. 1, 3, & 4. Top view of calicle. × 5·5

Fig. 2. Ground-off base. × 6.

Figs. 5 & 6. Side view of calicle. × 5·5

XV.—*Descriptions and Records of Bees.*—CLXIX.

By T. D. A. Cockerell, University of Colorado.

Andrena meadowsi, sp. n.

♂.—Length about 16 mm., anterior wing 11.

Black, the head and thorax with long bright fox-red hair; head large and broad, width about or almost 5 mm., facial quadrangle much broader than long; clypeus dull and granular; malar space very short; mandibles long, with an inner tooth; cheeks broad and rounded; process of labrum highly polished, broad, not at all emarginate; antennæ black, reaching base of scutellum; third joint much longer than fourth; mesothorax and scutellum dull; area of metathorax broadly triangular, dull, without evident sculpture; tegulæ black, largely hidden by red hair. Wings dusky hyaline, faintly darker at apex; stigma narrow, bright ferruginous; nervures brown; basal nervure meeting nervulus; second cubital cell very broad, receiving recurrent nervure at middle; third cubital cell long. Legs black, the hind tibiæ and all the tarsi more or less brownish, hair of legs pale red. Abdomen shining, finely and closely punctured, the punctures running in rows; seen from above, the abdomen shows much red hair at base and sides, but no evident bands, but in lateral view there is erect red hair thinly covering the tergites, and also basal bands at sides of tergites; hind margins of tergites narrowly reddened; second tergite depressed less than a third; venter with much red hair.

California: Avalon, Santa Catalina Island, March 9, 1930 (*Don Meadows*).

Named after the collector, to whom we are indebted for nearly all our knowledge of the Lepidoptera of Catalina Island. The specimen belongs to Pomona College, and was kindly loaned to me by Professor W. A. Hilton. This is a very remarkable and beautiful species, not like any other in the North American fauna, though running in my tables near *A. haynesi* V. & C., which differs in many respects, and occurs on sunflowers in Nebraska.

Andrena escondida, sp. n.

♂.—Length about 8·5 mm., anterior wing 6·8.

Black, head and thorax with very long dull white pubescence, very faintly yellowish on head and upper part of thorax; head broad, facial quadrangle broader than long, eyes practically parallel; no dark hair at sides of face or front; clypeus dull; cheeks broadly rounded, very hairy; malar space linear; mandibles black, process of labrum broad and truncate; antennæ black, short for a male (flagellum about 2·5 mm. long); third antennal joint about as long as next two together; mesonotum dull, shining posteriorly, and the anterior half with a shining median line; scutellum shining, depressed on middle; area of metathorax large, dull, without strong sculpture; tegulæ very dark brown. Wings hyaline, faintly dusky; stigma well developed, dark brown; nervures brown; basal nervure meeting nervulus; second cubital cell receiving first recurrent nervure distinctly beyond the middle. Legs black, with pale hair, reddish on inner side of tarsi. Abdomen shining, with long hair on first tergite; tergites 2 to 4 have narrow white hair-bands, broadly interrupted on second; fifth tergite has a band of longer hair, and sixth the same; apical plate pale reddish at end, truncate.

California: Rancho Escondido, Catalina Island, at flowers of *Encelia californica*, March 31, 1938 (*W. P. Cockerell*).

This could not be matched in the large collection at the Citrus Experiment Station. The abdomen is like that of *A. campanulæ* Vier. & Ckll., but the head is larger and the antennæ are shorter. By the abdomen, and the broad head, it resembles a species from Florissant, Colorado, bearing a manuscript name of Viereck's, but that has the flagellum red beneath and a pallid stigma. Type in my collection, but this and other island types will eventually go to the California Academy.

Andrena mimetica falli Cockerell.

California: Avalon, Catalina I., male at *Acacia*, March 20 (*Cockerell*); females, March 9 (*D. Meadows*).

Andrena auricoma Smith.

California: Catalina I., Avalon, male on *Sanicula*, March 18 (*Cockerell*); male (*Walter Conrad*); Pebbly Beach, female, April 6 (*Cockerell*); Little Harbor, male, June 14 (*W. Conrad*).

Diandrena gnaphalii, sp. n.

♂.—Length about 7 mm., anterior wing 6·3.

Head, thorax, and abdomen olive-green, the head and thorax dull, the abdomen shining; head large and broad, with very broad flattened cheeks; face and front with very long white hair, but sides of face with very long black hair; clypeus dull; mandibles slender, black; process of labrum strongly binodose; thorax with very long dull white hair; metathorax bluish, the basal area rugulose, not evidently plicate; tegulæ shining black. Wings hyaline, faintly dusky; stigma very dark brown, nervures pale brown; basal nervure falling a little short of nervulus; first recurrent nervure a little more distant from base of second cubital cell than second from apex. Legs black, with long pale hair, tinged with orange on inner side of hind tarsi. Abdomen olive-green, the second and following tergites with linear pale reddish margins, hardly noticeable; tergites with thin erect pale hair, the third and following with weak inconspicuous bands.

California: Avalon, Catalina Island, March 30, 1938, two at flowers of *Gnaphalium bicolor* Bioletti. Collected by Mrs. W. P. Cockerell.

Mr. Timberlake kindly compared this with his series of Californian *Diandrene*, and reported that it came very near *D. olivacea* Viereck. I find that *D. olivacea*, described from the female, has "stigma and costa yellowish stramineous," hence it cannot be our insect. *D. subchalybea* Viereck has the stigma dark brown, but the pubescence is different. *D. nothocalaidis* Ckll. is very similar, but the head is not so broad, and the base of metathorax has strong plicæ. *D. perchalybea* Viereck has a larger, redder, stigma, and the male mandibles are stouter, with the inner tooth much nearer the apex.

Dioxys catalinensis, sp. n.

♂.—Length 8 mm.

Black, without any red, the mandibles, antennæ, tegulæ, and legs black, the wings rather dilute fuliginous; head and thorax with thin white hair; clypeus dull; mesonotum glistening between the coarse punctures; scutellum shining, well punctured; thoracic spine short;

basal nervure falling short of nervulus; spurs black. Abdomen well punctured, the tergites with narrow pure white hair-bands; sixth tergite broadly truncate, concealing the seventh; a short spine at each side of apex.

California: Pebbly Beach, Catalina Island, April 2, 1938 (*W. P. Cockerell*).

Resembles *D. martii* Ckll., from New Mexico, but easily distinguished by the much less coarsely punctured abdomen, with much narrower bands, and the short obtuse sixth tergite. Type in my collection. The species is not in the collection at the Citrus Experiment Station.

Halictus hammondi, sp. n.

♀.—Length about 9·5 mm., anterior wing 7.

Black, head and thorax mainly dull, abdomen shining; head broad, facial quadrangle about square; upper part of clypeus dull, the lower part highly polished; supraclypeal area and band along inner orbits shining; antennæ black; mesothorax dull, shining on disc posteriorly; scutellum shining; area of metathorax finely rugulose (the microscope shows a minutely reticulate surface); tegulæ black or nearly so. Wings hyaline, faintly reddish; stigma very large, red; outer recurrent and intercubitus weakened; second cubital cell receiving recurrent nervure some distance from end; hair of thorax thin, dull whitish. Legs black, with pale hair, a bright copper-red brush at end of hind basitarsus; hind basitarsi broad; hind spur with four broad rounded lamellæ, the third low and the fourth rudimentary. Abdomen with thin pruinose pubescence at bases and apices of second and following tergites; first tergite polished, the punctures hardly visible under a lens.

California: San Miguel Island, May 3, 1938 (*Cockerell*). Visits flowers of *Layia platyglossa*.

This looks at first sight just like *H. robustus* Crawford (which my wife recently took at El Gavilan, near Riverside, California), but it is easily distinguished by the character of the hind spur, the minutely reticulated area of metathorax, the dull upper part of clypeus, and dull mesonotum. Type in my collection. Named after Mr. Geo. Hammond, whose red aeroplane was our means of transport to San Miguel Island, and whose many beneficent activities in relation to the island deserve to be commemorated.

Halictus avalonensis, sp. n.

♀.—Length about 6 mm.

Black, in nearly all respects like the common mainland *H. nigrescens* Crawford, of which it might be considered a subspecies, but it differs thus: head larger and broader; flagellum dark, very faintly brownish beneath; stigma brown, conspicuously darker (about as in *H. macoupinensis* Rob.). Abdomen robust, black, the margins of the tergites not appreciably pallid; hair of apical tergites inconspicuous. The hind spur has four very well-developed but blunt teeth, and is essentially of the same type as that of *H. nigrescens*. From several other allied species this is known by the small size and dullish (not polished) mesonotum; the clypeus and supraclypeal area are conspicuously shining; the second and third abdominal tergites have patches of tomentum at lateral bases, not always evident. The radiating sculpture of the area of metathorax is extremely delicate.

California: Avalon (type-locality), Catalina Island, thirteen taken March 23, visiting flowers of cultivated marguerite daisy; Pebbly Beach, April 2, one (*Cockerell*). Type in my collection.

The other species of *Halictus* taken on Sta. Catalina Island are:—

H. ovaliceps Cockerell, Pebbly Beach, April 4 (*Cockerell*) and April 6 (*W. P. Cockerell*). Visiting *Scrophularia villosa*.

H. meliloti catalinensis Cockerell. Avalon, common at marguerite daisy, *Coreopsis gigantea*, &c. One at Middle Ranch.

H. incompletus Crawford (Timberlake det.), one at Middle Ranch, March 21 (*W. P. Cockerell*).

From San Miguel Island we know ten species of *Halictus*, all different from those on Catalina Island.

Hylæus polifolii catalinensis, subsp. n.

♂ (type).—With a more or less developed supraclypeal mark, or this may be absent. Antennæ darker, but variable.

♀.—With a small light spot near apical margin of clypeus, not always present. Lateral marks much better developed, broad in middle, more as in *P. wootoni* Ckll.

California: Pebbly Beach, Sta. Catalina Island, April 2 (*W. P. Cockerell*), very abundant at flowers of *Gnaphalium bicolor*. Females were taken at Avalon, visiting marguerite daisy.

This is a race which differs from the common mainland species, but the characters are variable. Type in my collection.

Alcidamea hypocrita Cockerell.

California: Catalina Island; Avalon, male at marguerite daisy, March 23 (*W. P. Cockerell*), male, March 27 (*Vickers*); Pebbly Beach, females, April 2 (*W. P. Cockerell*), male at *Lotus*, April 6 (*Cockerell*).

Osmia clarescens Cockerell.

California: Catalina I.; my wife and I collected this at Avalon, males at *Sedum* and marguerite daisy; Pebbly Beach, both sexes, visiting *Lotus*; Middle Ranch, males; Rancho Escondido, male at *Lotus ornithopus* Greene.

Osmia regulina Cockerell.

California: Catalina I.; Pebbly Beach, both sexes (*Cockerell*, *W. P. Cockerell*). Visits *Lotus*.

Diadasia australis mimetica Cockerell.

California Catalina I.; Howland's, both sexes, May 3, 1933 (*D. Meadows*). Previously known only from Santa Cruz Island.

Emphoropsis miserabilis (Cresson).

California; very abundant on San Miguel Island in May, especially visiting *Phacelia scabrella*.

On Catalina Island the genus is represented by *E. depressa* (Fowler), also abundant.

In the related genus *Anthophora*, *A. edwardsii* occurs both on Catalina and San Miguel Islands, but *A. stanfordiana* Ckll. only on Catalina, where it is common, especially visiting *Astragalus leucopsis* Torrey.

Colletes californicus Provancher.

Not uncommon on San Miguel Island in May, but *Epeolus eastwoodæ* Ckll., presumed to be its parasite, is commoner. As the *Colletes* is common on the mainland, I wrote to ask Timberlake if he had ever taken *E. eastwoodæ*, but he replies that he appears not to have it—

in fact, he does not recall taking any *Epeolus* in the spring. The female *E. eastwoodæ* has a pair of short bands on anterior part of mesonotum, and falls nearest to *E. arciferus* Ckll.

Nomada (*Holonomada*) *avalonica*, sp. n.

♀.—Length about 12 mm., anterior wing 9·5

Similar in most respects to *N. edwardsii* Cresson, but differing thus: flagellum of antennæ very stout, entirely red; third antennal joint shorter than fourth; lateral face-marks going almost to top of eye; yellow abdominal bands very broad, not or hardly constricted in middle, the margin of the black at base of first tergite undulate. The axillæ are without spots, but there is a large yellow spot at each side of area of metathorax. The mesonotum has four yellow stripes. By the red flagellum this resembles *N. pecosensis* Ckll, but that has the flagellum much more slender, and the third antennal joint much longer.

California: Avalon, Sta. Catalina Island, March 18, 1938 (*W. P. Cockerell*); March 19 (*Cockerell*).

This species was taken at practically the same place as specimens of *Andrena perimelas* Ckll., on which it is believed to be parasitic. But it is a singular thing that on San Miguel Island, in May, my wife and I took *A. perimelas* and a similar large *Nomada* which may be presumed to be its parasite. This S. Miguel *Nomada* is not *N. avalonica*, but is *N. edwardsii* Cresson, a species well known on the mainland. *N. avalonica* was also examined by Mr. Timberlake and was unknown to him. Type in my collection.

Perdita layiæ, sp. n.

♀ (type).—Length about 6 mm., anterior wing 4·5.

Head and thorax mainly dark bluish green, with outstanding dull white hair; the polished supraclypeal area is black with a slight brassy tint; the clypeus is black with a broad transverse yellowish-white band, which is more or less constricted before each end, and has an upwardly-directed triangular extension in middle; this clypeal marking is variable, and sometimes much reduced; no lateral marks; head broad, shining; mandibles reddish, with a yellowish-white spot at base; antennæ black, the flagellum beyond the middle (but not at extreme tip) dusky whitish beneath; mesothorax and scutellum shining, black, the mesothorax broadly green in front; area of metathorax large, dark green, dull; no light markings on thorax; tegulæ testaceous. Wings greyish; stigma hyaline, with a dusky margin; marginal cell long, the poststigmatal part rather longer than the substigmatal. Legs black, hairy, the front knees yellowish white. Abdomen flattened, very dark brown, with five broad yellowish-white bands, which are notched sublaterally behind; the first three bands are usually narrowly interrupted; venter brown, with more or less developed light spots at sides.

♂.—Length about 5·5 mm.

With broad abdomen, having rather the aspect of a small *Spinoliella*; the broad low clypeus, labrum except a black spot in middle, greater part of mandibles, and lateral face-marks forming equilateral triangles, are all yellowish white; scutellum greenish; abdomen with six rather slender pale bands, the first two broadly notched sublaterally behind, the others divided sublaterally, and the first four narrowly interrupted in middle; these markings may be reduced, with the first and second bands divided into four spots.

California: San Miguel Island, near the ranch house, May 4 to 8, visiting *Layia platyglossa* (F. & M.), on which it appears to be oligotropic. Specimens were taken by my wife and myself; my wife found it nesting in hard sand.

This species runs out both on my tables and on Timberlake's unpublished table of Californian *Perdita*. The female seems near to one of Timberlake's new species, but differs by lacking the lateral face-marks. It goes near to a subspecies of *P. interrupta* Cresson, which will be published by Timberlake, but differs by the first tergite not being metallic, and the bands are different. I consulted Mr. Timberlake, who says that he has no *Perdita* from *Layia*, and he does not recognise my species asany known to him. Type in my collection: cotypes will be sent to British Museum *.

Females of *Halictus pavonotus* Ckll. were also taken at the *Layia* on San Miguel.

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* Since this was written, Mr. Timberlake has examined *P. layiæ*, and finds it structurally nearest to an undescribed species from the vicinity of Claremont, California.

Triepeolus rufotegularis (Ashmead).

Described (1900) under *Epeolus*, from females taken in Grenada and the Grenadines, British West Indies. I have just received both sexes from St. Vincent, April 5, 1938 (*J. Ogilvie*). The male has the same thoracic pattern as the female. The species appears to be quite closely related to *T. verbesinæ* Cockerell, from the Gulf of California, Arizona, and New Mexico.

XVI.—*Notes on British Eocene and Pliocene Terebratulas.* By Helen M. Muir-Wood, D.Sc., F.G.S., Department of Geology, British Museum (Natural History).

The British Pliocene Terebratulas include some giant forms, the dimensions of which have never been equalled by Mesozoic or Recent species. The conditions at that period of coastal shell-banks appear to have been especially favourable to Brachiopod development, and more than one stock has produced forms of exceptional size. *Terebratula maxima* Charlesworth, as its name implies, is the largest known species of the Terebratulidæ, its dimensions exceeding that of the British Jurassic giants, *Loboidothyris ampla* (J. Buckman), from the Inferior Oolite, and *Epithyris marmorea* (Oppel), from the Forest Marble. *T. maxima* is accompanied in the Coralline Crag by an unnamed form of approximately the same dimensions, which appears to be an external homœomorph, but has different internal structure in the brachial valve, and is evidently derived from a different stock. Another distinct large form occurs in the Belgian Pliocene at Antwerp in the "Sables gris à Bryozoaires."

In addition to these examples of external homœomorphy among the gigantic forms, numerous specimens of a previously unrecorded small Terebratellid are associated with, and are almost indistinguishable externally from, the young examples, 2–10 mm. long, of *T. maxima* and *T. orfordensis*, sp. n. These small shells occur at Sutton, Suffolk, in the Coralline Crag. The Terebratulas are distinguished externally by the development of a pedicle-collar in the interior of the ventral umbo even in the earliest growth-stages, while no such structure occurs in the Terebratellid. The latter has a flattened umbo, better defined beak-ridges, and is incipiently dorsally uniplicate at a length of 9 mm., possibly the size of the adult shell. In the interior of the pedicle valve the Terebratellid has well-defined dental lamellæ, which are not found in the Terebratulid. In the interior of the brachial valve of the Terebratellid the inner socket-ridges are fused with the crural bases and extend postero-anteriorly. No hinge-plates are developed, but a median trough bears a low septal ridge. A short median septum projecting ventrally from the point of attachment to the shell-floor unites with the two descending branches of the loop, which increase in width anteriorly. No ascending branches are seen in a specimen 4 mm. in length. The relation of this curious small Terebratellid species to Recent genera is unknown, as the loop is not preserved in the larger specimens. The immature loop resembles the pre-ismeniform stage of the loop of *Dallinella* without the hood. The minute median septum and posterior septal ridge were seen in three specimens from 3 to 4 mm. in length, and the septal ridge only in a specimen 6 mm. long. The contrasting internal structure of the young Terebratulas is described fully for the species *T. maxima* in the systematic descriptions.

Investigation of these forms has been undertaken in connection with a new Tertiary Brachiopod exhibit, which has necessitated a general revision of British Pliocene species.

The Pliocene Terebratulas were briefly described by S. S. Buckman in 1908, but in spite of his researches there is still considerable confusion regarding the nomenclature of the various species.

Buckman distinguished four distinct forms from the British Pliocene: "(1) A large oval form. (2) A large elliptical form. (3) A medium-sized, narrow, elliptical form. (4) Small aged forms, which are dwarfs." Forms 1 and 2 are said to be from the Coralline Crag, while 3 and 4 belong to the Red Crag. For form (1) Buckman proposed the name *T. spondylodes* Smith; for (2) *T. maxima* Charlesworth; for (3) *T. variabilis* Sowerby; while (4) is said to be unnamed.

T. perforata Defrance is said to be intermediate between forms (2) and (3), while *T. maxima* Charlesworth (2) is distinguished by Buckman from *T. spondylodes* (1) by its narrower and more elliptical shell. The small form from the Coralline Crag figured by Charlesworth as *T. maxima* (1837, p. 93, fig. 13 *b, c*) is said to be "of the shape of *T. variabilis*."

No diagnosis or figures were given by Buckman for any of these species, and no lectotype was chosen for *T. spondylodes* W. Smith.

All the British Crag Terebratulas had been previously grouped together in one species by T. Davidson (1852, 1874 A) and S. V. Wood (1874), who both considered them to be identical with *T. grandis* Blumenbach. The latter species was described originally from near Osnabruck, and subsequent authors have shown that it is an Upper Oligocene species of N. Germany and quite distinct from the British Crag specimens. Vincent (1893) figured the interior of the brachial valve of *T. grandis* from the Oligocene of Bünde, near Osnabruck, for comparison with that of the specimen of *T. maxima* figured by Davidson in 1874 A (pl. ii. fig. 1). Von Koenen (1867) also figured two specimens of *T. grandis* showing the loop, and stated that the type came from the Upper Oligocene of Astrup, near Osnabruck. A number of distinct species occur in this region, but a pedicle valve resembling Blumenbach's original figure is preserved in the British Museum (Nat. Hist.) from Astrup, near Osnabruck [BB. 3294]. *T. grandis* Blumenbach differs from the British Crag species by its more incurved umbo concealing the symphytium, by its highly convex valves, by its more circular shell-outline, and more massive shell. The growth-lines in *T. grandis* are prominent and lamellose as in the Red Crag forms.

A general description of the cardinalia of the Crag Terebratulas was given by J. W. Jackson in 1918 (p. 76), and the differences between the hinge-plates and loop, etc., of these forms and of Recent species of *Liothyrina* [=*Gryphus*] were pointed out. The existence of a pedicle-collar in the ventral valve of the fossil forms was noted by the same author in 1916 (p. 25).

SYSTEMATIC DESCRIPTIONS.

EOCENE.

Family **Terebratulidæ.**

Genus TEREBRATULA Muller.

Terebratula bartonensis Muir-Wood. (Figs. 1 A, 1 B.)

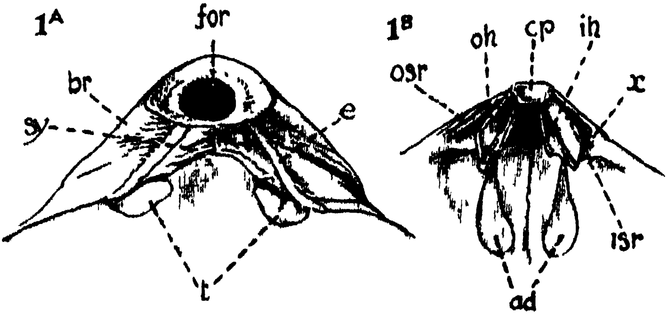
1852. *Terebratula bisinuata* ? Lamarck: T. Davidson, Mon. Brit. Foss. Brach. i. pt. 1, p. 19, pl. i. figs. 17, 17 *a*, 17 *b*.
1933. *Terebratula bartonensis* Muir-Wood, Proc. Geol. Assoc. xliv. p. 169, fig. xviii. 2. 2 *a*, 2 *b*.

When this species was described from the Upper Eocene, Barton Sands of Barton, Hants, only imperfect specimens of the pedicle valve were known. An imperfect detached brachial valve and two pedicle valves from the same horizon and locality have since been found in the Edwards Collection, British Museum (Nat. Hist.) BB. 3257 and BB. 3160, and have yielded additional information about the species.

Brachial Valve.—The posterior half only of this valve is preserved, but it corresponds to the slightly immature pedicle valve, the length of which is approximately 34 mm. and width 20 mm. The shell is very slightly convex, and no median fold is probably developed. Growth-lines are prominent, and show that this valve was approximately circular in outline in all growth-stages.

The loop and crura are not developed, but the crural bases appear as short ridges within the sulcus that separates the inner and outer hinge-plates (fig. 1 B). The narrow inner hinge-plates are not fused and project ventrally, while the outer hinge-plates slope steeply up from the sulcus containing the crural bases to unite with the inner socket-ridges. Narrow outer socket-ridges extend for a distance of 8 mm. almost parallel with the shell-margin. The hinge-sockets are narrow and almost concealed by the inner socket-ridges which project across them. The cardinal process projects ventrally over the hinge-plates as a small laterally elongated boss with slightly excavated posterior surface bounded by a low marginal rim.

The adductor muscle-scars are elongate-oval in outline, with the outer margin curved and inner margin concave, the two scars recurving medianly at their anterior end.



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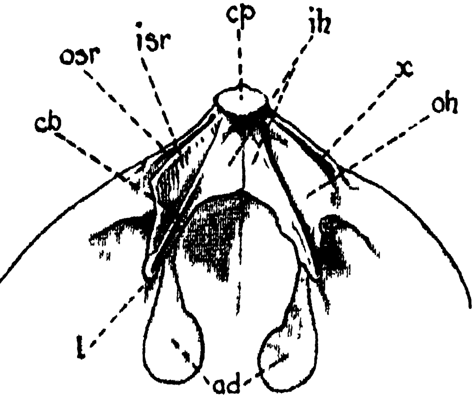


Figs. 1 A, B.—*Terebratula bartonensis* Muir-Wood. Upper Eocene, Barton Sands, Barton, Hants. S. V. Wood. Coll. B.M. [BB. 3257].

Fig. 1 A. Posterior portion of pedicle valve showing mesothyrid beak-ridge, *br*; thickened edge of inter-area for insertion of teeth, *e*; marginate foramen, *for*; fused deltidial plates, or symphytium, *sy*; hinge-teeth, *t*. × 2.

Fig. 1 B. Posterior portion of interior of corresponding brachial valve showing adductor muscle-scars, *ad*; cardinal process, *cp*; inner hinge-plate, *ih*; inner socket-ridge, *isr*; outer hinge-plate, *oh*; outer socket-ridge, *osr*; hinge-socket, *x*. × 1½.

Fig. 2.—*Terebratula orfordensis*, sp. n. Paratype. Pliocene, Coralline Crag, Orford, Suffolk. B.M. [BB. 3474]. × 1½. Posterior portion of interior of brachial valve showing adductor muscle-scars, *ad*; crural bases, *cb*; simple cardinal process, *cp*; fused inner hinge-plates, *ih*; inner socket-ridge, *isr*; broken end of descending branch of loop, *l*; outer hinge-plate, *oh*; outer socket-ridge *osr*; hinge-socket, *x*,

Pedicle Valve.—The immature pedicle valve showed short rounded mesothyrid beak-ridges, which become permesothyrid in position in the adult shell.

Remarks.—The internal characters of the brachial valve differ from those of *T. hantonensis* Muir-Wood from the London Clay of Catisfield, near Fareham, Hants, in the form of the cardinal process, which in *T. hantonensis* is less tranverse and bears a median ridge on its posterior surface, while the anterior surface is medianly lobed. The inner hinge-plates in *T. hantonensis* are extremely narrow and are either horizontal or dorsally, instead of ventrally, curved. The crural bases in the London Clay species are more clearly defined and the hinge-sockets broader than in *T. bartonensis*, while the adductor muscle-scars differ in outline in the two species. It is doubtful, therefore, whether these two species really belong to the same genus and if either are correctly ascribed to the genus *Terebratula* sens. str. Both species differ from the Pliocene species of *Terebratula*, *T. maxima* Charlesworth, and *T. orfordensis*, sp. n., by the internal characters of their brachial valves.

The internal characters of the brachial valve of *T. putzeysi* Vincent, as figured in 1923 from the Eocene of Laeken, Belgium, appear to be similar to those of *T. bartonensis*. These two species occur in the Upper Eocene, Bartonian, the Belgian form coming from the Sables of Wemmel. The dimensions of the English species are greater than those of the Belgian form, but the external shape is very similar.

PLIOCENE.

Terebratula spondylodes W. Smith.

1817. *Terebratula spondylodes* W. Smith, Stratigraphical System of Organized Fossils, p. 12.

1908. *Terebratula spondylodes* Smith: S. S. Buckman, Ann. & Mag. Nat. Hist. (8) i. p. 446.

Smith's description of this species is :—" Oval, rather depressed, with sharp transverse lines of growth ; a large circular foramen in the beak ; two projecting thick teeth in the lower valve : shell thin, depressed on each side of the beak.

"The large perforation on the beak is grooved circularly, and also the recess beneath the beak, shell thin, except at the teeth of the hinge."

The localities given for this species are:—"Foxhole, Newborn, Aldborough (an upper valve ?)."

No figure is given by Smith and no specimens are preserved in his collection in the British Museum (Nat. Hist.).

The localities given by Smith suggest that his description was based on a mixture of Red Crag and Coralline Crag specimens, but the description without a figure is not sufficient to define any particular Crag species. The oval shape, large foramen, and thin shell suggest possibly *T. orfordensis*, sp. n., but this species does not occur at any of the localities quoted by Smith. Buckman (1908) suggested that the name should be applied to a large oval form occurring in the Coralline Crag, but unfortunately he gave no description of the form intended. For the above reasons no attempt has been made to redefine this species.

Vincent (1923, p. 51) stated that following Buckman (1908) the name *T. spondylodes* should be employed instead of *T variabilis* for the large *Terebratula* from the Diestian of Belgium

CORALLINE CRAG.

Terebratula maxima Charlesworth, emended Muir-Wood.

(Fig. 4.)

1837. *Terebratula maxima* E. Charlesworth (partim), Mag. Nat. Hist. (n. s.) i. p. 92, figs. 13 *a*, 14.

1852. *Terebratula grandis* Blum. : T. Davidson (partim), Mon. Brit. Foss. Brach. i. pt. 1, p. 16, pl. ii. figs. 1, 1 *a*, 1 *b*, 2, 3, 4.

1874. *Terebratula grandis* Blumenbach : S. V. Wood (partim), Supp. Crag Moll. iii. pt. 2 (Palæont. Soc.), p. 168, pl. xi. figs. 5 *a-d*, ? 5 *e*, *f*.

1874. *Terebratula nobilissima* S. V. Wood, ibid. p. 168.

1908. *Terebratula maxima* Charlesworth : S. S. Buckman, Ann. & Mag. Nat. Hist. (8) i. p. 447.

Non 1924. *Terebratula maxima* Friedberg (non Charlesworth), Kosmos, Lemberg, xlix. 3, p. 563, fig. 6 [Miocene of Poland].

This species was accurately figured by Charlesworth in 1837 from the Coralline Crag of Sudbourne, Suffolk. His figs. 13 *a*, 14 depict the type, a detached pedicle valve, but figs. 13 *b*, *c*, represent a smaller narrower form, which has been described in this paper as *T. orfordensis*, sp. n.

Diagnosis.—Terebratulid, about 100 mm. long, 75 mm. wide, and 52 mm. thick, elongate-oval or subcircular in outline, pedicle valve more convex than brachial valve. Umbo erect to suberect, truncated by large marginate foramen, permesothyrid, beak-ridges obscure, anterior commissure uniplicate or incipiently sulciplicate. Apical angle about 80°. Inner hinge-plates separate in adult.

Lectotype.—The specimen figured by Charlesworth in 1837, figs. 13 *a*, 14, from the Coralline Crag of Sudbourne, Suffolk.

Material and Locality.—Numerous specimens from the Coralline Crag of SUFFOLK: Aldeburgh; Gedgrave; Orford; Ramsholt; Park Pit, Sudbourne; Sutton; near Woodbridge. Derived shells occur rarely in the Red Crag.

Dimensions of Specimen.—Brit. Mus. BB. 3404 *. Maximum length 96·9 mm.; maximum width 73·7 mm.; maximum thickness 52·2 mm. Charlesworth's type measured from the figure is 105 mm. long and 76 mm. wide.

Description.—Young specimens of *T. maxima* occur associated with specimens of *T. orfordensis* and a Terebratellid at Sutton, Suffolk. The two species of *Terebratula* are indistinguishable in early growth-stages, and both are approximately circular in outline and slightly biconvex. The Terebratellid is usually more elongate, but is not easily distinguished unless the internal structure of either of the valves is exposed. The young Terebratulid shells range in size from about 2 mm. upwards. The pedicle-collar is well developed even in the earliest growth-stages, and forms a narrow rim detached from the shell-floor in the interior of the ventral umbo, and attached to the incipient deltidial plates. The latter are seen only as small triangular outgrowths projecting into the delthyrium from the edge of the inter-areas. The pedicle-opening is therefore delimited principally by the pedicle-collar in the early growth-stages. The two deltidial plates fuse to form a symphytium when the shell is about 15 mm. long. The symphytium increases in width postero-anteriorly and becomes concave in the adult shell.

* Figured T. Davidson, 1852, pl. ii. fig. 1.

The beak-ridges are always ill-defined, but appear to be mesothyrid in young shells and permesothyrid in the adult. The foramen is circular, with a thickened rim *of varying width in the ephebic and gerontic stages. In senile individuals this rim is flattened and about 3 mm. in width, and tends to project slightly on the* dorsal side beyond the symphytium. The umbo is erect in young forms, but becomes suberect in adult shells. The thickened edge of the pedicle valve which bounded the open delthyrium in the young shell can be distinguished on either side of the symphytium of the adult as a narrow parallel-sided band which is well demarcated from the interareas.

The two valves are biconvex in all growth-stages and are usually circular in outline until the shell attains a length of about 50 mm. It then elongates until the length is slightly in excess of the width, when a broad dorsal uniplica is developed. The shell tends to taper anteriorly with the development of a short linguiform extension in the pedicle valve. The median fold is not well demarcated from the lateral slopes and is depressed by a shallow sulcus causing incipient biplication (sulciplication) in the gerontic stage.

Growth-lines are numerous and rather prominent, especially in the later growth-stages. Colour-banding can be distinguished in many of the specimens which are yellow-brown in colour with dark brown patches distributed along some of the growth-lines of the mature shell and on the posterior part of both valves. Fine longitudinal striations are irregularly developed on the external shell-surface.

Internal Characters.—Brachial valves about 2 mm. in length show a single narrow plate or cardinal platform, which is concave ventrally and extends along the straight posterior hinge-margin. The hinge is less than the greatest width of the shell and may be termed submegathyrid (Buckman, 1917). No cardinal process is developed at this stage. The inner socket-ridges are given off from the anterior side of this cardinal platform and project slightly above the floor of the valve. In a specimen 2·5 mm. in length the cardinal platform was incipiently Λ-shaped, and narrowed medianly. The inner socket-ridges joined the lateral ends of this platform. The loop was represented by two processes, tapering acutely, which projected from the hinge-plates. The crural bases in a third specimen were seen to extend along the inner margin of the hinge-plates. With increase in curvature of the hinge-line the cardinal platform is gradually replaced by resorption and redeposition by the inner socket-ridges and hinge-plates which diverge from the umbo as in the adult, and a minute cardinal process is now developed. The outer hinge-plates are separated from the crural bases by a shallow sulcus in specimens 5 mm. in length. No inner hinge-plates were observed in any of the young shells examined, but no well-preserved specimens between the lengths of 10 mm. and 20 mm. were available. The inner hinge-plates are probably fused when first developed, and only diverge from one another and finally become well separated in the ephebic and gerontic stages. In a specimen 23 mm. long [BB. 3032] the inner hinge-plates were in contact posteriorly but curved away from one another anteriorly.

Specimens 55 mm. in length show well-defined flattened inner hinge-plates diverging from one another immediately anterior to the cardinal process. They are bounded along their outer margin by the crural bases, which form a narrow knife-like ridge extending dorso-ventrally and uniting with the outer hinge-plates. The latter are concave and curve up on to the prominent inner socket-ridges. The hinge-plates and crural bases are in contact with the shell-floor posteriorly, but curve away from it anteriorly. There is, however, no umbonal cavity such as occurs in many Mesozoic species. The inner socket-ridges form a strong lateral buttress below the hinge-plates and with the socket-floor they extend parallel to the shell margin for a short distance. The hinge-sockets are partially overlapped by the inner socket-ridges, and are enclosed posteriorly on their outer margin by the outer socket-ridges. The cardinal process is a thin semicircular plate projecting from the umbo at an angle of about 90°. The upper or ventral surface is slightly excavate within a raised rim for the attachment of the adductor muscles, but the cardinal process is never lobate anteriorly, although the base may be thickened.

Adductor muscle-scars in the brachial valve resemble those figured in *T. orfordensis* but are proportionately broader, and the division into posterior and anterior adductors is well defined. The posterior adductors form elongate-oval scars projecting posteriorly as a stalk beyond the subtrigonal anterior adductors. The two scars are separated by a bifurcating ridge continued anteriorly as the impression of the two main vascular trunks.

The interior of the pedicle valve is frequently much thickenened posteriorly and the teeth are supported on massive buttresses. The muscle-scars are usually ill-defined, but elliptical diductors enclosing narrow adductor scars could be distinguished in one or two specimens. The posterior end of the adductors and diductors is separated by a low median ridge. Anteriorly the two main vascular trunks are given off from the end of the diductors.

Variation.—Variants with a narrower shell than the type, more incurved umbo, and more sulciplicate anterior commissure occur rarely, and appear to be related to *T. maxima* rather than to *T. orfordensis*. Other variants have a more circular shell outline and slightly less massive umbo. Some of the latter should possibly be identified as *T.* cf. *maxima* mentioned in "Remarks."

Remarks.—*T. maxima* is distinguished from *T. orfordensis* by its larger dimensions and greater width of the shell, by its larger apical angle, less erect umbo, and less advanced folding of the shell, as well as by differences in the internal characters of the brachial valve.

T. maxima is accompanied in the Coralline Crag by a giant form of similar dimensions, but with different internal structure in the brachial valve. This homœomorph, which can be referred to as *T.* cf. *maxima* (fig. 5), is known by detached brachial valves which appear to be more circular in outline than *T. maxima.* The cardinal process, which is considerably larger than in *T. maxima*, is trilobed anteriorly and excavate on its posterior surface, with a prominent raised rim. This rim is discontinuous on the dorsal side, but projects inwards on the ventral side, causing partial bilobation of the posterior surface of the cardinal process. Diverging from the cardinal process in the adult shell are two rounded prominent ridges representing the fused inner hinge-plates and crural bases. Traces of thickened narrow inner hinge-plates were seen in an immature specimen almost in contact with the crural bases. A deep sulcus separates these inner plates from the inner socket-ridges with which the outer hinge-plates are fused. The sockets are shallow and little overlapped by the inner socket-ridges. The adductor scars are narrower and are more tapering anteriorly than in *T. maxima.*

As the two valves of *T.* cf. *maxima* have not so far been found united the pedicle valve is unknown. Detached pedicle valves with a less massive and less erect umbo than *T. maxima* may, however, belong to this species. Young shells about 25 mm. long showed similar characters to those of the adult, and usually lacked inner hinge-plates.

T. maxima and *T.* cf. *maxima* are probably not congeneric, but their derivation is at present unknown. The cardinal process of *T.* cf. *maxima* resembles that of Chalk species. The large specimen figured by Davidson as *T. grandis* (1874, pl. viii. fig. 1) from the Sables gris à Bryozoaires of Antwerp is not identical with *T. maxima*, and it is doubtful if the latter species occurs outside Britain. The young form (fig. 2) shows the pedicle-collar well developed.

The brachial valve showing the complete loop from the Coralline Crag of Ramsholt and Suffolk figured by Davidson (1874 A, pl. ii. fig. 1) and S. V. Wood (1874, pl. xi. fig. 5 *a*) is unfortunately missing from the Davidson Collection.

The large specimen figured by Friedberg (1924) as *T. maxima* (non Charlesworth) from the Miocene is an unrelated giant form with a more circular shell, 70 mm. long and wide, a more incurved umbo concealing the symphytium, an apical angle of 140°, and a plane anterior commissure. The internal characters are unfortunately unknown.

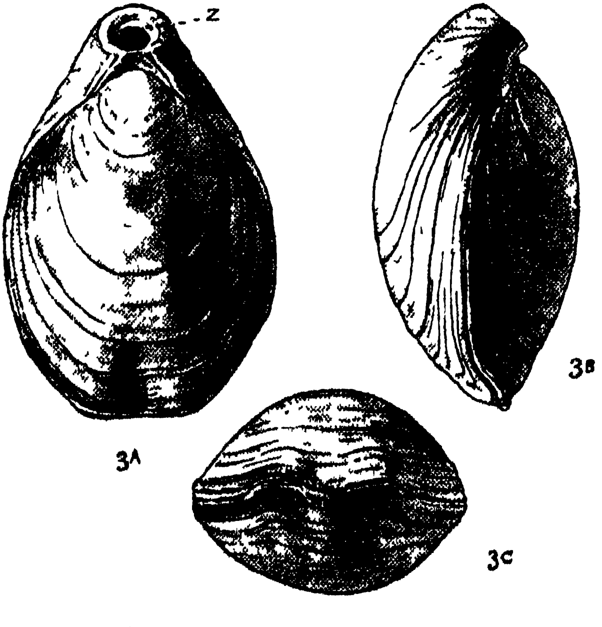
Thomson (1916) figured a specimen from the English Crag of an unknown locality as *T. spondylodes*. The photograph is extremely poor, but the specimen is probably a young example of *T. maxima* Charlesworth.

Terebratula orfordensis, sp. n. (Figs. 2, 3 A–C.)

1837. *Terebratula maxima* E. Charlesworth (partim), Mag. Nat. Hist. (n. s.) i. p. 92, figs. 13 *b*, *c* (only).

Diagnosis.—Terebratulid about 70 mm. long, 50 mm. wide, and 37 mm. thick, elongate-oval in outline, biconvex, sulciplicate in gerontic stage, umbo massive, erect, truncated by large marginate foramen, beak-ridges rounded, mesothyrid. Apical angle 70°. Interior of brachial valve with fused inner hinge-plates in adult shell.

Type-specimen.—Holotype from the Pliocene, Coralline Crag, of Park Pit, Sudbourne, near Orford, Suffolk, and preserved in the Walker Collection, British Museum (Nat. Hist.), BB. 3477.



Figs. 3 A–C.—*Terebratula orfordensis*, sp. n. Holotype. Pliocene, Coralline Crag, Park Pit, Sudbourne, near Orford, Suffolk. B.M. [BB. 3477]. ½ nat. size.

Fig. 3 A. Dorsal view, showing marginate foramen, pedicle-collar, *z*, concave symphytium, and thickened margin of inter-areas. Vertical line shows actual length of shell.

Fig. 3 B. Lateral view of same specimen.

Fig. 3 C. Anterior view of same specimen, showing sulciplication.

Material and Locality.—Numerous specimens from the Coralline Crag of SUFFOLK: Gedgrave; Orford; Sudbourne. Immature shells from Sutton.

Dimensions of Holotype.—Maximum length 70·2 mm.; maximum width 49·1 mm.; maximum thickness 36·9 mm.

Description.—In the neanic stage both valves are convex and the shell approximately circular in outline. At a distance of about 25 mm. from the umbo the length is slightly greater than the width, and the shell then becomes increasingly elongated in ephebic and gerontic stages. Umplication is developed at a shell-length of about 50 mm., and is immediately followed by sulciplication, which, however, never produces a prominent fold or deep sinus. Small shells from 1 mm. upwards in length occur in the Coralline Crag, and may be the young of either *T. maxima* or *T. orfordensis*, the two being almost indistinguishable up to a length of about 20 mm. The deltidial plates are not fused in young shells of 1–10 mm. in length, and appear as small triangular projections at the side of the delthyrium and in direct connection with the pedicle-collar. The latter structure bounds and limits the size of the pedicle opening in the youngest shells observed. The margin of the pedicle valve on the outer side of the deltidial plates is thickened for the attachment of the teeth, and appears as a narrow smooth area adjoining each side of the broad symphytium or fused deltidial plates of the adult shell (fig. 3 A). The foramen is circular and is surrounded by a broad thickened rim which shows concentric lines of growth.

Colour-banding is well seen in most of the specimens as dark brown patches on the umbonal slopes of the pedicle valve, posterior part of the brachial valve, and extending along some of the growth-lines. The remainder of the shell is yellow-brown in colour.

The shell becomes thickened in the gerontic stage, but young shells are more fragile and usually imperfectly preserved. Growth-lines are numerous, but are only prominent in the gerontic stage. Longitudinal striations are irregularly developed on the external shell surface.

Internal Characters.—Detached valves are rather rare, but the four brachial valves examined showed the inner hinge-plates to be fused medianly in the adult shell. The flat inner hinge-plates are separated from the slightly curved outer hinge-plates by the crural bases, which form a well-defined narrow ridge extending almost to the cardinal process (fig. 2). The ill-defined inner socket-ridges are fused with the outer hinge-plates and overlap the sockets.

The cardinal process is a small semicircular plate projecting ventrally at an angle of 90° to the umbo, and having the posterior surface slightly excavated. The anterior surface is never trilobed.

The adductor muscle-scars are broad anteriorly, but taper rapidly posteriorly in a somewhat club-shaped outline. The two scars converge anteriorly.

The pedicle valve showed rather small posteriorly notched teeth supported by slightly swollen bases. The muscle-scars of this valve are usually obscure.

Variation.—Rare variants of this species have more convex brachial and pedicle valves and a slightly narrower shell. The length in the adult is similar to that of the typical form.

Remarks.—*T. orfordensis* is distinguished from *T. maxima* Charlesworth by its narrower shell and different growth-stages, smaller dimensions, smaller apical angle, more convex brachial valve, and by the more marked anterior biplication of the shell which follows immediately after a short ill-defined uniplicate stage. The beak-characters of the two species are similar, but the beak-ridges in *T. orfordensis* are mesothyrid. In the interior of the brachial valve the inner hinge-plates are usually fused in the adult shell, and the thickening seen in gerontic examples of *T. maxima* was not observed in this species.

T. orfordensis differs from *T. variabilis* J. de C. Sowerby, from the Red Crag, by its broader thinner shell, which tapers less rapidly towards the umbo, by its less convex brachial valve, by its larger dimensions and less marked growth-lines, which are more numerous and lamellose in the Red Crag species.

The anterior commissure of *T. variabilis* is plane or only incipiently biplicate, and the shell is frequently asymmetrical or dwarfed owing to unfavourable conditions of the Red Crag sea. The internal characters of the brachial valve differ in the two species.

No examples of this species have so far been seen from the Belgian Pliocene, but similar detached brachial valves with fused inner hinge-plate and pedicle valves with similar beak-characters occur in the Crag deposits of La Manche, N. France.

RED CRAG.

Terebratula harmeri A. Bell, emend. Muir-Wood.

(Figs. 6, 8.)

1874. *Terebratula grandis* Blumenbach: S. V. Wood, Supp. Crag. Moll. iii. pt. 2 (Palæont. Soc.), p. 168, pl. viii. fig. 11 *c* only.

1921. *Terebratula harmeri* A. Bell, Ann. Rep. Phil. Soc. Yorks. for 1920, p. 2.

This species was described by Bell (1921), who referred to S. V. Wood's figures (1874, pl. viii. figs. 11 *a–c*) of three specimens of *T. grandis* Blumenbach from the Red Crag of Waldringfield, Suffolk. Of these the specimens shown in pl. viii. figs. 11 *a*, *b*, should be identified as *T. variabilis* J. de C. Sowerby, but fig. 11 *c* is a more elongate narrower shell to which the name *T. harmeri* is now restricted.

Diagnosis.—Terebratulid about 30 mm. long, 19 mm. wide, and 15 mm. thick, elongate-elliptical in outline, biconvex, pedicle valve posteriorly tubular, umbo erect, truncated by large foramen, permesothyrid, beak-ridges obscure, anterior commissure plane or incipiently uniplicate. Apical angle 50°.

Lectotype.—The specimen figured by S. V. Wood in 1874, pl. viii. fig. 11 *c*, from the Red Crag of Waldringfield, Suffolk. This specimen is not preserved in the S. V. Wood Coll., Brit. Mus. (Nat. Hist.).

Material and Locality.—Pliocene, Red Crag (Waltonian, Newbournian, and Butleyan) of Essex and Suffolk. ESSEX: Oakley (detached water-worn valves); Walton-on-Naze (detached weathered pedicle valves). SUFFOLK: Felixstowe (detached water-worn valves); Waldringfield (valves united or if detached usually not water-worn); Woodbridge (valves usually united).

Dimensions of specimen, B.M. [B. 45105] from Waldringfield.—Maximum length 28·5 mm.; maximum width 19·1 mm.; maximum thickness 15·1 mm. Detached pedicle valve [B. 45028] from Walton-on-Naze. Maximum length 33·5 mm.; maximum width 19 mm.

Description.—Immature examples from Waldringfield range upwards in size from 5 mm. At this stage the two valves are subcircular in outline, very slightly convex, and the deltidial plates are discrete. At a length of 10 mm.

the two valves are elongate-oval in outline and the deltidial plates are fused to form the symphytium. The pedicle-collar is developed even in the earliest growth-stage examined, and delimits the size of the pedicle-opening. The pedicle valve becomes considerably more convex than the brachial valve and tends to be almost tubular, the flanks being steeply arched. The ventral umbo is erect and massive and truncated by a circular and slightly marginate foramen. The beak-ridges are obscure but are probably permesothyrid.

Internal Characters.—In the brachial valve the inner hinge-plates are fused posteriorly, but curve away from one another anteriorly. They are separated from the outer hinge-plates by the crural bases, which extend almost to the cardinal process as narrow low ridges. The outer hinge-plates slope up steeply to join the inner socket-ridges which diverge from the umbo at an angle of 50°. The sockets are narrow, deeply excavated, and overlapped by the inner socket-ridges, and are supported on their outer margin by the outer socket-ridges. The cardinal process is a semicircular and posteriorly excavated plate with a prominent rim. It projects at an angle of 90° to the dorsal umbo. The adductor muscle-scars are pyriform in outline, tapering posteriorly, and enlarging and converging anteriorly. One complete loop and one lacking the transverse band are preserved from Waldringfield and Woodbridge, Suffolk [BB. 3192, 3295], in two immature specimens. The complete loop, in the specimen 9 mm. in length [BB. 3192], is 5·5 mm. long, with short descending branches, curved transverse band, and prominent crural processes. The latter are 2·25 mm. in length and curve ventrally, converging slightly towards a median line, and taper acutely. The crural processes are given off immediately below the point of junction of crura with the hinge-plates.

In the pedicle valve the muscle-scars are usually obscure.

Remarks.—*T. harmeri* differs from *T. variabilis* in its smaller dimensions, narrower shell, and more tubular pedicle valve and more convex brachial valve.

Terebratula perforata Desnoyers. (Fig. 12.)

1825. *Terebratula perforata* Defrance MS.: Desnoyers, Mém. Soc. hist. nat. Paris, ii. p. 239. (With reference to figure of Dale in 'Appendix to Hist. & Antiq. Harwich,' 1730, p. 294, pl. xi. fig. 9 (Concha longa Fossilis fasciata).)

1827. *Terebratula variabilis* J. de C. Sowerby (partim), Min. Conch. vi. p. 148, pl. 576, fig. 4.
1908. *Terebratula perforata* Defrance: S. S. Buckman, Ann. & Mag. Nat. Hist. (8) i. p. 446.
1916. *Terebratula perforata* Desnoyers: R. B. Newton, J. Conch. London, p. 145, pl. iv. figs. 15–17.

This species, which was attributed to Defrance by Desnoyers in 1825, was apparently never described by that author, and Desnoyers seems to have been the first to publish a description of *T. perforata*. Desnoyers referred to a figure given by Dale in Taylor, 1730, p. 294, pl. xi. fig. 9, as "Concha longa Fossilis fasciata," the original of which should be taken as the type of the species. Dale's figure depicts a detached ventral valve which is approximately circular in outline and tapers rapidly to the umbo. This shell is approximately 48 mm. long and 41 mm. wide, slightly convex, and has prominent concentric growth-lines, or rugæ, and no median fold or sinus. The foramen is small and circular and the symphytium short. The hinge-teeth are massive and in close proximity to one another.

No definite locality is given for this specimen, but all Dale's material was obtained from the neighbourhood of Harwich, Essex.

Careful comparison of this figure with Pliocene specimens soon shows that it is a Red Crag form and that almost identical ventral valves occur in that formation at Felixstowe, near Harwich. Typical specimens are preserved in the British Museum (Nat. Hist.) collections [B. 9952, BB. 3193–96] from that locality, and consist of detached pedicle and brachial valves.

Diagnosis.—Terebratulid, about 55 mm. long, 45 mm. wide, and 28 mm. thick, subcircular to elongate-oval in outline, tapering rapidly to umbo, biconvex, incipiently sulciplicate, umbo short, erect, truncated by circular narrowly marginate foramen, beak-ridges mesothyrid to permesothyrid. Inner hinge-plates separate or incompletely fused. Apical angle 75°.

Material and Locality.—About twenty specimens from the Pliocene, Red Crag, including six immature forms with valves attached. ESSEX: Oakley. SUFFOLK: Felixstowe; Foxhall; Waldringfield; Woodbridge. ? also from the Boxstones. KENT: Lenham Beds of Lenham.

Description.—Immature specimens about 20 mm. in length occur rarely with the valves joined. The shell

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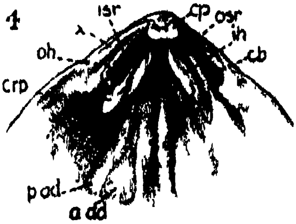

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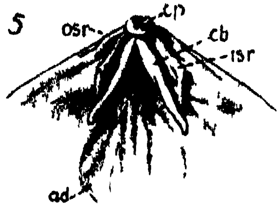

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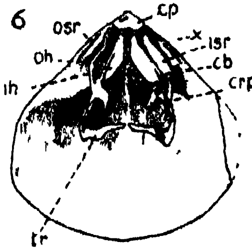

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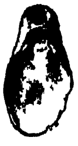

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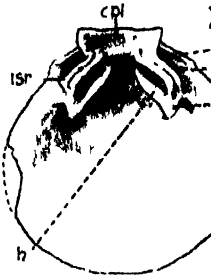

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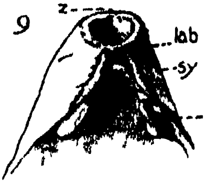

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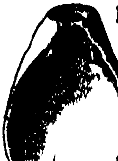

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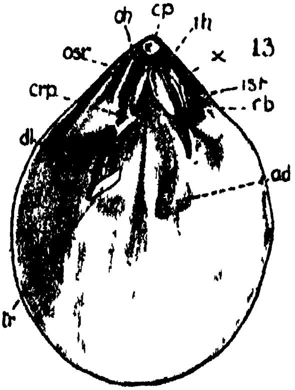

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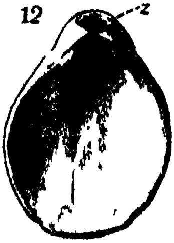

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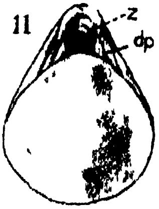

Fig. 4.—*Terebratula maxima* Charlesworth emend. Pliocene, Coralline Crag, Orford, Suffolk. B.M. [BB. 3475]. $\frac{4}{3}$ nat. size. Umbonal region of interior of brachial valve, showing crural bases dividing hinge-plates, *cb*; flattened cardinal process, *cp*; crural process, *crp*; inner hinge-plate, *ih*; inner socket-ridge, *isr*; outer hinge-plate, *oh*; outer socket-ridge, *osr*; hinge-socket, *x*. Posterior adductor scars, *pad*, and anterior adductors, *aad*.

Fig. 5.—*Terebratula* cf. *maxima* Charlesworth. Homœomorph of *T. maxima*. Pliocene, Coralline Crag, Suffolk. B.M. [BB. 3476]. $\frac{4}{3}$ nat. size. Umbonal region of interior of brachial valve, showing lobate cardinal process, *cp*; crural bases fused with inner hinge-plates, *cb*; inner socket-ridges, *isr*; and prominent outer socket-ridges, *osr*. Narrow adductor scars, *ad*.

is circular in outline, with a plane anterior commissure. Incipient biplication is then developed without any intervening uniplication. Both valves are convex in early growth-stages, but the convexity of the pedicle valve exceeds that of the brachial valve. The ventral umbo is short, erect, and rather massive, and truncated

Fig. 6.—*Terebratula harmeri* Bell emend. Pliocene, Red Crag, Waldringfield, Suffolk. T. Davidson Coll., B.M. [BB. 3192]. ×2½. Interior of brachial valve, showing crural bases, *cb*; flattened cardinal process, *cp*; complete crural processes projecting ventrally, *crp*; transverse band of loop, *tr*. Other letters as for fig. 4.

Fig. 7.—*Terebratula* sp. Immature specimen 2 mm. long of *T. maxima* or *T. orfordensis*, sp. n. Pliocene, Coralline Crag [Sutton], Suffolk. B.M. [BB. 3492]. ×15. Interior of brachial valve showing cardinal platform of early straight-hinged stage before development of cardinal process and serving for attachment of diductor muscles. The loop is represented by two rounded bosses, *cb*. The hinge-plates, *h*, are not differentiated into an inner and outer series. Outer socket-ridges, *osr*, and inner socket-ridges, *isr*, are well developed, the latter are dorsally excavated.

Fig. 8.—*Terebratula harmeri* Bell emend. Pliocene, Red Crag, Walton-on-Naze, Essex. F. W. Harmer Coll. B.M. [B. 45028]. ½ nat. size. Interior of pedicle valve, for comparison with *T. variabilis* and *T. perforata*.

Fig. 9.—*Terebratula variabilis* J. de C. Sowerby. Red Crag, Waldringfield, Suffolk. B.M. [B.B 3180]. Nat. size. Umbonal region of well preserved pedicle valve, showing labiate foramen, *lab*; broad symphytium, *sy*; massive hinge-teeth, *t*; and pedicle-collar, *z*.

Fig. 10.—*Terebratula variabilis* J. de C. Sowerby. Red Crag, Waldringfield, Suffolk. S. V. Wood Coll. B.M. [BB. 3052]. ½ nat. size. Interior of pedicle valve, with umbo and symphytium much abraded.

Fig. 11.—*Terebratula* sp. Immature specimen of *T. maxima* or *T. orfordensis*, sp. n. 3 mm. long. Coralline Crag, Sutton, Suffolk. S. V. Wood Coll. B.M. [BB. 3481]. ×8½. Pedicle valve shows disjunct deltidial plates, *dp*, joined to pedicle-collar, *z*, which restricts the size of the delthyrium in immature shells.

Fig. 12.—*Terebratula perforata* Desnoyers. Red Crag, Felixstowe, Suffolk. B.M. [BB. 3478]. ½ nat. size. Typical much worn pedicle valve, showing pedicle-collar, *z*, and remains of symphytium.

Fig. 13.—*Terebratula variabilis* J. de C. Sowerby. Red Crag, Waldringfield, Suffolk. B.M. [BB. 3180]. Nat. size. Interior of brachial valve corresponding to pedicle valve fig. 9, showing portion of transverse band, *tr*, and descending branch of loop, *dl*. Other letters as for fig. 4.

All the specimens are preserved in the British Museum (Natural History) Collection.

by a circular foramen surrounded by a narrow thickened rim. A pedicle-collar is developed. The beak-ridges are scarcely distinguishable in most specimens, but probably were mesothyrid in young specimens and permesothyrid in the adult. The symphytium narrows medianly and is frequently not preserved in detached ventral valves.

In the interior of the brachial valve the inner hinge-plates are narrow and may be fused immediately below the cardinal process, but are well separated anteriorly. The crural bases extend as narrow raised ridges almost to the cardinal process, and separate the inner and outer hinge-plates.

The outer hinge-plates are markedly concave and dip down steeply from the crural bases and rise steeply again to unite with the prominent inner socket-ridges. These ridges diverge from the umbo at an angle of about 55°, and appear as depressions in the internal casts of the brachial valve in the Lenham Beds. These internal casts appear at first sight to be ventral valves with impressions of strong dental lamellæ. The hinge-sockets are shallow and rather narrow and bounded on their outer margin by clearly defined outer socket-ridges. The cardinal process is seldom well preserved, but appears as a small thin semicircular plate projecting ventrally from the umbo at an angle of 90°. The ventral surface is very slightly excavate for the attachment of the diductor muscles.

The dorsal adductor muscle-scars are pyriform in outline, converging anteriorly and tapering posteriorly, with a convexly curved outer and concave inner margin. The shell between the two adductors is much thickened into a sort of platform.

Traces of ovarian markings are seen in some brachial valves on the outer posterior side of the adductors.

In the pedicle valve the teeth are supported by swollen bases and are closely placed, as shown in Dale's figure of the type. The muscle-scars of this valve are usually obscure.

Remarks.—S. S. Buckman (1908) referred to this species, but did not redefine it. He stated, however, that Sowerby's specimen of *T. variabilis* from the Red Crag, represented in pl. 576, fig. 4, appeared to be identical with *T. perforata*.

The specimens figured by R. B. Newton as *T. perforata* (1916) from the Lenham Beds of Kent, now considered to be Lower Pliocene in age, appear to be similar to the Red Crag forms from Felixstowe. The preservation of these specimens from Lenham is very poor, but their dimensions, shell outline, and internal characters of the brachial valve resemble those of *T. perforata*.

It is doubtful whether the specimens from the Miocene of the north of France commonly identified as *T. perforata* are identical with the Red Crag form. Friedberg (1927) figured a specimen from the Miocene, Redonian, of Noellet, Maine-et-Loire, France, as *T. perforata* which has a more incurved umbo, more convex brachial valve, and more clearly defined mesothyrid beak-ridges than the Pliocene form. The umbonal characters of the Miocene species are similar to those of *T. hantonensis* Muir-Wood from the London Clay. The loop of this Miocene species from the Loire was figured by E. E. Deslongchamps (1863, p. 295, pl. viii. figs. 15, 16*a*, *b*) as *T. grandis*. The hinge-plates are not shown, but the loop differs slightly from that of the Crag forms.

J. de Morgan (1915, p. 260) referred to this species in his synonymy of *T. hoernesi* Suess, and quoted Defrance in Dict. Sci. Nat. vol. liii. p. 151. No reference to *T. perforata* by Defrance occurs in that publication.

Bell (1921, p. 3) stated that he had found specimens similar to those figured by Newton from Lenham in the Suffolk Boxstones [Lower Pliocene].

Vincent (1923, p. 51) stated that *T. perforata* occurs in the Crag of England and the Cotentin, and not in the Miocene.

In 1829 Desnoyers (p. 443) referred to "la grande *Terebratula perforata* (Defr.) ou *spondylodes* (Smith)," and evidently used this name for all large Tertiary Terebratulas of any region.

Terebratula variabilis J. de C. Sowerby.

(Figs. 9, 10, 13.)

Non 1813. *Terebratulites variabilis* Schlotheim, Leonhard, Min. Taschenbuch, vii. pl. i. fig. 4 (Rhynchonellid).

1827. *Terebratula variabilis* J. de C. Sowerby, Min. Conch. vi. p. 148, pl. 576, figs. 2, 3, 5.

1844. *Terebratula sowerbyana* Nyst, Mém. Cour. Ac. roy. Belge, xvii. p. 335 (nom. nov. for *T. variabilis* J. de C. Sowerby, non *Terebratulites variabilis* Schlotheim 1813).

1852. *Terebratula grandis* Blumenbach: T. Davidson (partim), Mon. Brit. Foss. Brach. (Palæont. Soc.) i. pt. 1, p. 16, pl. i. fig. 18.
1874. *Terebratula grandis* Blumenbach: S. V. Wood (partim), Suppl. Crag Moll. iii. pt. 2 (Palæont. Soc.) p. 168, pl. viii. figs. 11 *a*, *b*.
1874. *Terebratula grandis* Blum.: T. Davidson (partim), Mon. Brit. Foss. Brach., Suppl. (Palæont. Soc.) iv. pt. 1, p. 15, pl. ii. figs. 2, 2 *a*, 3, 4.
1893. *Terebratula variabilis* Sowerby: Vincent (partim), Ann. soc. roy. malac. Belge, Mém. xxviii, p. 55.
1908. *Terebratula variabilis* J. de C. Sow.: S. S. Buckman, Ann. & Mag. Nat. Hist. (8) i. p. 445.
Terebratula grandis auctt. partim.

This species was described by J. de C. Sowerby from a number of detached valves which are said to be from the Crag. No locality is given for any of these specimens, and subsequent authors have assumed that they were derived from the Coralline Crag and have identified them as *T. grandis* Blumenbach.

Nyst (1844), assuming that *Terebratula variabilis* Sowerby was preoccupied by *Terebratulites variabilis* Schloth., a Liassic Rhynchonellid, proposed the name *T. sowerbyana*.

Vincent (1893) included a number of species under the name *T. variabilis*, and refigured Davidson's drawing (1874 A, pl. ii. fig. 1) of the brachial valve of *T. maxima* Charlesworth to illustrate it.

S. S. Buckman (1908) was the first to recognize *T. variabilis* as a Red Crag species and distinct from the Coralline Crag forms. One of Sowerby's syntypes was selected by him as lectotype.

Diagnosis.—Terebratulid, about 50 mm. long, 35 mm. wide, and 27 mm. thick, elongate-oval in outline, pedicle valve more convex than brachial valve, umbo massive, erect to suberect, truncated by large marginate or labiate foramen, beak-ridges permesothyrid, obscure, anterior commissure dorsally curved or incipiently sulciplicate. Apical angle 60°.

Lectotype.—The detached pedicle valve figured by Sowerby in 1827, pl. 576, fig. 2, from the [Red] Crag (probably of Suffolk), was selected as lectotype by S. S. Buckman in 1908. This specimen is not preserved in the Sowerby Collection, British Museum (Nat. Hist.).

Material and Locality.—Numerous specimens, usually with valves detached, from the Pliocene, Red Crag (Waltonian, Newbournian, and Butleyan). ESSEX: Beaumont; Oakley; Walton-on-Naze (all water-worn), SUFFOLK: Bentley; Felixstowe; Foxhall; Pettistree Hall; Shottisham (all water-worn); Sutton; Waldringfield; Woodbridge (often with valves united or little water-worn).

Dimensions of Lectotype (from figure).—Maximum length 56 mm.; maximum width 35 mm. Specimen no. BB. 3180 (with valves joined): maximum length 48·9 mm.; maximum width 34·6 mm.; maximum thickness 26·2 mm.

Description.—Immature examples of this species are slightly wider than the young shells of *T. harmeri*, and the pedicle valve is usually less tubular posteriorly. Some of the smaller specimens are, however, dwarfs, and possess adult shell- and beak-characters. Both valves are convex in all growth-stages, the convexity of the pedicle valve being about twice that of the brachial valve.

In some of the detached valves, especially those from Walton-on-the-Naze, Oakley, and Beaumont, the shell is exceptionally thick, the pedicle valve tapers rapidly to the erect umbo, which is perforated by a large marginate foramen as in the type. The umbo being much abraded may appear to be almost horizontally truncated in these forms. In the Waldringfield and Woodbridge specimens with attached valves gerontic characters appear in the pinching-in of the umbonal slopes, greater elongation of the umbo and symphytium, and thickening of the rim surrounding the foramen, which tends to become labiate. In these phylogerontic forms the shell tapers gradually to the suberect umbo, and there is a tendency for the pedicle valve to become elongated and tubular, possibly due to an increasingly unfavourable environment. In specimens with a marginate foramen the rim is about 3 mm. wide, while in labiate specimens it is slightly wider dorsally, but the pedicle opening remains circular and constant in size. The beak-ridges are permesothyrid and always obscure. The symphytium is well exposed and broad in the phylogerontic forms.

The growth-lines are very numerous, lamellose, and imbricating, and frequent growth-halts cause irregularities in the contour of the shell. Owing to the staining by iron oxide colour-banding cannot be distinguished.

Internal Characters.—In the brachial valve the inner hinge-plates are in contact posteriorly in the immature specimens, but curve away from one another near the base of the cardinal process in the adult shell. They are demarcated from the outer hinge-plates by the crural bases, which form narrow knife-like ridges extending dorso-ventrally and uniting with the curved outer hinge-plates. The latter rise steeply to unite with the prominent inner socket-ridges. Thickening of the inner socket-ridges and inner hinge-plates is seen in some of the dwarfed specimens. The sockets are narrow and deeply excavated between the two sets of socket-ridges. The cardinal process is a simple semicircular plate with the posterior surface excavated, and rarely with a low median ridge extending dorso-ventrally. The base is slightly enlarged but never lobate.

The loop is 18 mm. long in a brachial valve 44 mm. in length (fig. 13). The ascending branches and transverse band are not preserved, and the crural processes are imperfect in this specimen. In a slightly immature specimen one crus was preserved, and resembled that figured for *T. harmeri*.

The muscle-scars in the brachial valve are always well defined and deeply excavated. Their outline is pyriform tapering posteriorly, and the two scars converge towards the thread-like euseptoidum anteriorly. The division into posterior and anterior adductors can be seen in some specimens.

Ovarian markings can be seen as pittings in the shell on the postero-lateral part of both valves.

In the pedicle valve the adductors are narrow and posteriorly placed and frequently separated by a low median ridge. The diductors are narrow and elongated and enclose the adductors.

Remarks.—*T. variabilis* is distinguished from *T. perforata* by its smaller dimensions, narrower shell, which tapers to a more produced umbo. From *T. harmeri* it is distinguished by its larger dimensions, broader shell, and less tubular pedicle valve. The three species have very similar internal characters and belong to the same genus.

T. variabilis is distinguished from *T. orfordensis*, sp. n., by its narrower and less biplicate and more massive shell and by its more tapering umbo.

S. S. Buckman (1908) referred to the figure given by Charlesworth (1837, figs. 13 *b*, *c*) as being of the shape of *T. variabilis*. This form is now described as *T. orfordensis*, sp. n.

Careful study of the British Eocene and Pliocene Terebratulas shows that the various species belong to at least three distinct genera. *T. bartonensis* Muir-Wood, from the Upper Eocene, Barton Beds, differs from *T. hantonensis* Muir-Wood, from the Lower Eocene, London Clay, in external form and in differences in the inner hinge-plates, cardinal process, and shape of dorsal adductor muscle-scars. These two species probably do not belong to the same genus, but the loop of *T. bartonensis* is unfortunately unknown, and only one imperfect interior of the dorsal valve has been examined.

The relationship of these two species to the Pliocene forms is also uncertain. *T. hantonensis* lacks the long crura characteristic of the loop of Pliocene species, its narrow inner hinge-plates are usually dorsally deflected and well separated instead of horizontal and more or less in contact with one another, as in the Pliocene forms. The folding of the shell of *T. hantonensis* is also more advanced than that of the British Pliocene species.

All the British Pliocene forms except *T.* cf. *maxima* appear to belong to one genus, and *T. orfordensis*, sp. n., with fused inner hinge-plates, is the most primitive type. *T.* cf. *maxima*, with its massive lobate cardinal process and crural bases fused and inseparable from the inner hinge-plates, might possibly be derived from *T. hantonensis*, in which the cardinal process tends to become anteriorly bilobed and the inner hinge-plates much reduced in width in some specimens. Until more is known of the internal structure of French, German, and Belgian Tertiary species it is impossible to trace the evolution of these species.

It is extremely doubtful if any of these species really belong to the genus *Terebratula*. The genotype *Terebratula terebratula* (Linné) was redefined by Buckman (1907), following Douvillé (1880, p. 264), who took one of the specimens figured by Colonna in 1616 from 'In Civitate Andriæ' referred to in Linnæus's original description, as the genolectotype. Buckman (1907, pl. xii. figs. *a–c*) figured a specimen from the Pliocene of Monte Mario, near Rome (Brit. Mus. no. 83458), which is said to be identical with Colonna's figure. This specimen is readily distinguished from the British Pliocene species by its strongly biplicated shell, the plications extending almost to the umbo, and the much incurved umbo concealing the symphytium. The internal characters of this Italian Pliocene species are unknown, and the British Eocene and Pliocene species are therefore left for the present in the genus *Terebratula*.

T. ampulla Brocchi, an Italian Pliocene species which closely resembles *T. terebratula* in external form, has a shorter loop than in the British Crag species, and the inner hinge-plates as figured by Sacco (1902) are extremely narrow and ventrally curved as in *T. bartonensis*.

The British Tertiary Terebratulas are readily distinguished from species of the Terebratulid genera *Gryphus* and *Liothyrella*, from Recent seas, by the development of inner and outer hinge-plates separated by crural bases in the fossil forms. The inner hinge-plates probably served for the attachment of the dorsal adjustor, or pedicle muscles, which are attached to the single pair of divided hinge-plates in the Recent genera.

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XVII.—*Melichar's 'Monographie der Cicadellinen.'* By W. E. China, M.A., Department of Entomology, British Museum (Natural History).

Before his death in 1924 Melichar had prepared a huge monograph on the Homopterous family Cicadellidæ (superfamily Jassoideæ). Owing to its size, the manuscript, which had been sent to Dr. G. Horváth for publication in the Annales Musei 'Nationales Hungarici,' was issued in parts. It was originally intended that a part should be issued in each volume of the 'Annales' but owing to financial difficulties in Hungary it was impossible to keep to this plan. Actually the following parts were published :—

1. Ann. Mus. Nat. Hung. XXI. pp. 195–243. 1924.
2. ,, ,, ,, ,, XXII. pp. 329–410. 1925.
3. ,, ,, ,, ,, XXIII. pp. 273–394. 1926.
4. ,, ,, ,, ,, XXVII. pp. 285–328. 1931.

Part 1 contained a key to the 54 genera of *Proconiaria*. The description of the species in these genera was completed in Part 3, and a key to the 101 genera of *Cicadellaria* also appeared in this part. Part 4 dealt only with the 90 species of the sixteenth genus *Cardioscarta* Mel. There remain 85 additional genera and their species to be published, and since in the key to the *Cicadellaria* some 66 new genera were established about 55 of these remain, seven years afterwards, without mention of genotype or species. In January 1930 Dr. Horváth informed me that the remaining manuscript was sufficient to fill 512 pages of the 'Annales' and calculated that the cost of publication would be £250. Since then Part 4 has appeared with 43 pages.

With the death of Dr. Horváth and present conditions in Central Europe, the likelihood of completion of publication seems very remote indeed. In order, therefore, to reduce the confusion which exists in the generic nomenclature of the Cicadellidæ through the existence of Melichar's 55 new genera, without genotype fixations or even species mentioned, I have decided to publish a list of the genotypes of these new genera which the late Dr. Horváth extracted from Melichar's manuscript and kindly sent to me in 1930. I do not propose to give all the species referred by Melichar to each genus, but in those cases where the genotype is a new species I have also given the established species where such have been included in the genus. Owing to lack of time, the genera in which the genotypes were originally described have not been given, but can easily be ascertained by specialists in the group. Most of the species have previously been described in the genera *Cicada*, *Cicadella*, *Tettigonia*, *Tettigoniella*, and *Kolla*.

II. Section CICADELLARIA.

18. *Microgoniella* Mel., genotype *M. pudica* F. Brazil, Bolivia.

22. *Metascarta* Mel., genotype *M. flavipes* Sign. Bolivia.

23. *Bucephalogonia* Mel., genotype *B. xanthophis* Berg. Argentine.

25. *Pseudoscarta* Mel., genotype *P. fastuosa* F. S. America.

26. *Exogonia* Mel., genotype *E. assimilis* Sign. Brazil.

28. *Paracatua* Mel., genotype *P. rubrolimbata* Sign. Bolivia, Colombia.

29. *Parinaeota* Mel., based on a new species from Peru.

30. *Maguangua* Mel., based on a new species from New Guinea, also includes ? *T. inconspicua* Walk. Waigou.

31. *Bothrogonia* Mel., genotype *B. ferruginea* F. Oriental region.

33. *Luzoniella* Mel., based on a new species from the Philippines.

34. *Gununga* Mel., genotype *G. jacobsoni* Mel. Java.

35. *Rophalogonia* Mel., genotype *R. scita* Walk. Venezuela.

37. *Paragonia* Mel., genotype *P. sanguinicollis* Latr. Colombia, Cuba.

38. *Paromenia* Mel., genotype *P. rufa* Walk. Venezuela.

40. *Alahana* Mel, genotype *A. erichsoni* Dist. Sumatra.

41. *Betarmonia* Mel., based on a new species from Brazil.

42. *Dasmeusa* Mel., genotype *D. pauperata* F. Surinam.

43. *Alocha* Mel., genotype *A. sordida* Sign. Surinam.

44. *Chromogonia* Mel., based on a new species from Colombia.

45. *Eugonia* Mel., genotype *E. diversa* Sign. Cayenne, Peru, Bolivia.

46. *Tragua* Mel., based on a new species from Colombia.

49. *Polisanella* Mel., based on a new species from the Philippines.

50. *Cephalogonia* Mel.. genotype *C. flabellula* Jac. Peru.

51. *Catagonia* Mel., genotype *C. lunata* Sign. Mexico.

52. *Algothyma* Mel., based on a new species from Colombia.

54. *Allogonia* Mel., genotype *A. concinnula* Fowl. Mexico.

55. *Mesogonia* Mel., genotype *M. ferrugatula* Bredd. Ecuador.

56. *Neokolla* Mel., genotype *N. hieroglyphica* Say. N. America.

58. *Balacha* Mel., genotype *B. melanocephala* Sign. Brazil.

59. *Apogonia* Mel., genotype *A. ståli* Sign. Mexico.

60. *Oragua* Mel., genotype *O. nebulosa* Sign. Brazil.

61. *Salvina* Mel., genotype *S. dorsisignata* Fowl. Panama.

63. *Juliaca* Mel., based on a new species from Colombia.

67. *Helocharina* Mel., genotype *H. gayi* Blanch. Chile.

69. *Tipuana* Mel., based on a new species from Bolivia.

70. *Murata* Mel., based on a new species from New Guinea.

73. *Pamplona* Mel., genotype *P. feralis* Fowl. Panama.

75. *Pachitea* Mel., genotype *P. habenula* Jac. Peru.

76. *Baleja* Mel., genotype *B. flavoguttata* Latr. Mexico.

78. *Amahuaka* Mel., genotype *A. angustula* Fowl. Mexico.

79. *Tahura* Mel., based on a new species from Peru.

80. *Synogonia* Mel., genotype *S. nasuta* Fowl. Guatemala.

81. *Mareja* Mel., genotype *M. limbaticollis* Stål. Mexico.

82. *Anchura* Mel., based on a new species from Peru.

83. *Oxygonia* Mel., genotype *O. ignifera* Walk. Colombia.

84. *Oxycoryphia* Mel., genotype *O. spatulata* Sign. Brazil.

86. *Clydacha* Mel., genotype *C. cochlear* Jac. Peru.

87. *Santarema* Mel., based on a new species from Peru.

89. *Orectogonia* Mel., genotype *O. sparsuta* Sign. Brazil.

90. *Astenogonia* Mel., genotype *A. bicolor* F. S. America.

92. *Ulozena* Mel., genotype *U. lineatocollis* Sign. Madagascar.

93. *Ehagua* Mel., based on a new species from Haiti.

95. *Euryogonia* Mel., based on a new species from Palawan, also included are *hebetula* Brodd., *ruficosta* Walk., *mitrata* Dist., and *vittifrons* Walk.

96. *Cofana* Mel., genotype *C. quinquenotata* Stål. Philippines.

98. *Apulina* Mel., based on a new species from Ecuador.

XVIII.—*Papers on Oriental* Carabidæ.—XXXIV. By H. E. Andrewes.

On the Types of Oriental *Carabidæ* described by V. de Motchulsky. (Part IV.)

When at the end of last year I published in this Journal a third note on this subject there seemed very little chance that any further types of this author would be discovered, but, to my surprise, and while my paper referred to above was still in the press, I received from Mr. Zhelochovstev of the Moscow University Museum, to whom I must here express my grateful acknowledgments, the types of a further seven species, of which I give some account below. In the case of synonyms an asterisk has been placed against the name which is to stand. Parts I. and II. appeared in the 'Transactions of the Royal Entomological Society,' the first in 1928 (pp. 1–24) and the second in 1933 (pp. 1–19); Part III. appeared last year in vol. xx. of this Jounral (pp. 572–574).

1. *Amara* (*Acrodon*) *uralensis* Motch. Ins. Sib. 1844, p. 191, t. 8, fig. 19=*Amara* (*Bradytus*) *consularis* Dufts.* Faun. Austr. ii. 1812, p. 112.

There is one example in fair condition. A small red label reads "Mt. Ural," and a larger white one reads "*Acrodon uralensis* m. Kamyschin." This place is on Volga, and a long way from the Ural Mountains. The synonymy was already known.

2. ***Bembidion*** (*Lymnaeum*) *quadriimpressum* Motch. in Schrenck's Reis. Amurl. ii. 1860, p. 90, t. 8, fig. 8; Bates, Trans. Ent. Soc. Lond. 1883, p. 269.

A single example in poor condition, now mounted on a card, but formerly pinned; only the basal joint of the antennæ remains. The label reads "*Lymnaeum quadriimpressum* Ménétr. Kamchatka," and on a small red label there are two words, one of which appears to be "Kurile." I cannot account for the introduction of Ménétriés' name. The specimens taken by George Lewis at Hakodate and identified by Bates agree with the type.

3. *Chlæminus* (*Distrigodes*) *flavoguttatus* Motch. Bull. Mosc. 1864, ii. p. 354; Chaud. Bull. Mosc. 1869, i. p. 404; Bates, Ann. Mus. Civ. Gen. xxxii. 1892, p. 363.

There is one example (♀) in only moderate condition. The label reads "*Distrigodes flavoguttatus* Motch. Ind. or.," but there is also a small, white, locality-label reading "Birma," probably indicating that the specimen came from the Helfer collection. The description is longer and more detailed than is often the case, and also fairly accurate. Chaudoir recognized the species and redescribed it, comparing his specimen, which also came from Burma and very likely from the same source, with *C. biguttatus* Motch. His description is also fairly accurate, as far as it goes, but the puncturation of the upper surface is not correctly described by either of these authors. In *biguttatus* the basal half of the prothorax is exceedingly finely punctate and pubescent, with a fair number of larger punctures between the basal sulci; *flavoguttatus* is said by both authors to be glabrous, but the prothorax has in fact a few small punctures and even a little pubescence at the sides behind, outside the sulci, and the number of punctures between the sulci is less than is usually the case in *biguttatus*. The elytra in front are apparently quite impunctate, apart from the rows of setiferous punctures along the intervals, but under the microscope a little fine scattered puncturation can be seen, more visible near apex. The third joint of the antennæ is pubescent on the apical half.

A ♂ specimen in the Prague Museum (Helfer coll.) agrees fairly closely with type. The ♀ example taken by Fea at Bhamo (Genoa Museum) and identified by Bates is larger than the type, the sides of the prothorax are more strongly rounded, the elytra are a little longer, and there is more evident pubescence at the apex. In the British Museum there is a specimen from Renong, Siam (*Doherty*), agreeing fairly with the type, though the hind angles of the prothorax are rather more conspicuous; the elytral spot, which normally covers intervals 5 to 7, is here split into two, the pale colour on interval 6 having disappeared, and the pubescence near apex is much more evident. For the present it seems best to treat the Genoa and British Museum examples as varieties.

4. *Abacetus* (*Distrigodes*) *bipunctatus* Motch. Bull. Mosc. 1864, ii. p. 355; Chaud. Bull. Mosc. 1869, i. p. 386.

There is only one example, but it is in good condition. There is a yellow label bearing the name and the locality "Ceylon," to which in the description the word "Colombo" is added. Chaudoir did not recognize the species, and I can find no other references. The author's description is poor, so I am redescribing the type.

Length 4·25 mm. Black, shiny: palpi, the two basal joints of the antennæ, legs, and apex of elytra and venter ferruginous.

Head impunctate, clypeal suture very fine, frontal foveæ fine, curving outwards on each side to mid-eye level, where they widen out a little, eyes moderately prominent, antennæ reaching a little beyond base of elytra. *Prothorax* very convex, a little less than a half wider than head, a fifth wider than long, base arcuate, evidently narrower than apex, sides finely bordered, presumably bisetose (setæ abraded), rounded from apex to base, where the hind angles project on each side as a minute rectangular tooth; median line very fine, a little deeper close to base, basal foveæ linear, rather short and fine, converging in front, joining the marginal channel on each side behind, the angle thus formed varying somewhat in its degree of obtuseness, surface impunctate, but there are about a dozen small punctures on each side between the median line and the fovea. *Elytra* convex, a little wider than prothorax, nearly two-thirds longer than wide, shoulders rather square, sides parallel; striæ moderately deep, impunctate, 2 arising in an umbilicate pore; intervals slightly convex, the outer ones very narrow towards apex, 3 with a well-marked dorsal pore at middle, surface impunctate. Microsculpture of the elytra formed by fine transverse lines, which make very wide meshes; on the head and disk of prothorax it is hardly visible. Underside impunctate, metepisterna longer than wide, metatarsal joints not sulcate, tarsal joint 5 without setæ beneath.

The species bears a very strong resemblance to *A. dejeani* Nietn. (Ann. & Mag. Nat. Hist. (3) ii. 1858, p. 178), also from Ceylon, but there the elytra have a microsculpture of isodiametric meshes. An examination of a number of specimens has revealed slight differences, chiefly in the impressions on the prothorax, but these are variable, and I can at present find no substantial character, other than the microsculpture, to distinguish the two species.

5. *Abacetus* (*Distrigodes*) *rufulus* Motch. Bull. Mosc. 1865, ii. p. 227; Chaud. Bull. Mosc. 1869, i. p. 386.

A yellow label reads "*Distrigodes rufulus* Motch. Ind. or.", but there is also a small white one reading "Birma." The single ♀ specimen, which is in poor condition, probably came from the Helfer Collection. I am unable to identify this with any other species, and give below a more detailed description than that of the author.

Length 4 mm. Ferruginous, the head and prothorax darker than the elytra; palpi, first joint of antennæ (rest wanting), and legs flavous.

Head impunctate, a small fovea on vertex, clypeal suture very fine, emarginate, frontal foveæ linear, curving sharply outwards on each side, and then inwards again, eyes moderately prominent. *Prothorax* very convex, nearly a half wider than head, a fourth wider than long, base truncate, narrower than apex, sides very finely bordered, presumably bisetose (setæ abraded), strongly rounded, sinuate behind quite close to the base, hind angles right but inconspicuous; median line very fine in front, rather deeper on basal third, basal foveæ moderately deep, slightly curved, linear, tending to diverge in front, joining the marginal channels on each side at the angles, surface impunctate, eight or ten punctures on each side between the median line and the fovea. *Elytra* very convex, a half wider than prothorax, two-fifths longer than wide, shoulders square, sides parallel at middle; striæ moderately deep, impunctate, 2 arising in an umbilicate pore; intervals slightly convex, 3 a little wider than the adjoining intervals, with a single dorsal pore, placed slightly before middle, adjoining stria 2, surface impunctate. Microsculpture of the elytra isodiametric, as is that of the head, the prothorax with vague transverse meshes. The metatarsi are apparently not sulcate, and the claw-joint is without setæ beneath; the condition of the specimen is such that I have not ventured to dismount it in order to examine the underside.

Chaudoir thought that Motchulsky's specimen might be an immature example of *A. pallipes* Chaud., which is black, and in many ways the two species are alike, but, apart from the colour, *rufulus* has a smaller head, a very faintly indicated clypeal suture, a relatively smaller prothorax, which is a little more contracted behind, and wider and more convex elytra, with an isodiametric microsculpture, that of *pallipes* being formed by transverse meshes.

6. *Abacetus* (*Astygis*) *dorsalis* Motch. Bull. Mosc. 1865, ii. p. 229; Chaud. Bull. Mosc. 1869, i. p. 397.

A single specimen in only moderate condition. A yellow label reads "*Astygis dorsalis* Mot. Ind. or.," but there is also a small locality-label reading "Madara" (Madura). In his Monograph on the genus *Abacetus* Chaudoir quite correctly identified with Motchulsky's species a specimen from Tranquebar. The species is found not only in the Madras Presidency, but also in Bombay, the Central Provinces, and Burma. I took it commonly many years ago at Belgaum (Bombay) in the vicinity of water, and have a note that, owing to their great agility, these insects were very difficult to catch.

It seems unnecessary to add a third description to the two already in existence, and I will only add that the base of the prothorax is unbordered, so that the lateral channels are unconnected with the basal foveæ, and that the microsculpture is throughout isodiametric. In the Burmese specimens the elytra are black, whereas in the typical South Indian form they are dark red, with a fairly broad black sutural stripe.

7. *Abacetus* (*Distrigus*) *picipes* Motch.* Bull. Mosc. 1865, ii. p. 228; Chaud. Bull. Mosc. 1869, i. p. 392=*A. maculipes* Chaud. Bull. Mosc. 1869, i. p. 384=*A. antepunctatus* Bates, Ann. Mus. Civ. Gen. xxxii. 1892, p. 362.

The type, a single specimen, is in medium condition and bears the label "Ind. or." I suspect that, like other species of the genus described by Motchulsky, it came from Helfer's Burmese collection, as did Chaudoir's specimen. The two Fea examples described by Bates also came from Burma.

Chaudoir's description occupies five lines; the other two descriptions are longer, but hardly adequate. The type measures 5·25 mm. in length, Bates's examples 5·5 mm., and Chaudoir gives 6–6·5 mm. The Prague specimens (coll. Helfer), which are labelled "*maculipes* Chaud.," I think in Chaudoir's writing, measure 5·5–6·25 mm.

Black, shiny, upper surface æneous; palpi, joints 1 to 3 of antennæ, and legs ferruginous to flavous, the femora more or less piceous, the margin of the venter sometimes narrowly rufous.

Head small, impunctate, frontal foveæ clearly marked, parallel in front, but curving outwards behind, not quite reaching hind-eye level (Bates says "usque post oculos continuati"), eyes moderately prominent, antennæ broken in type, but in other specimens somewhat dilated towards apex and extending a little beyond base of elytra. *Prothorax* convex, cordate, quite a half wider than head, not quite a third wider than long, base evidently wider than apex, sides bisetose, narrowly bordered, strongly rounded, sinuate just before the hind angles, which are right and sharp; median line very fine, but deeper close to base, basal foveæ fairly deep, linear, converging slightly in front and connected by a very fine line on each side with the lateral channels, surface generally impunctate, but there are about a dozen punctures on each side between the foveæ and the median line. *Elytra* convex, a fourth wider than prothorax, two-fifths longer than wide, shoulders square, sides parallel; striæ fairly deep, hardly perceptibly crenulate (Motchulsky says "elytris . . . subpunctato-striatis"), a little shallower towards apex, 2 arising in a small umbilicate pore; intervals convex, the outer narrower than the inner ones, 3 with a single pore, placed at a third to a fourth from base, adjoining stria 2, surface impunctate. Microsculpture formed by very fine meshes, isodiametric on the head and elytra, slightly transverse on the prothorax. Both pro- nad metasterna longitudinally sulcate, and both processes bordered; metepisterna a little longer than wide; meso- and metatarsal joints not sulcate, joint 5 without setæ beneath.

As Bates says, the species is near *submetallicus* Nietn. (=*chalceolus* Chaud.), and it is similar in size, but in Nietner's species the palpi, antennæ, and legs are much darker, the prothorax is narrower and less contracted behind, the elytral striæ are a good deal shallower, and the dorsal pore is not placed so far forward.

BURMA: Martaban (*Helfer*); Teinzo and Katha (*Fea*).

Note.—I am informed that the type of *Abacetus* (*Distrigodes*) *femoralis* Motch. (Bull Mosc. 1864, ii. p. 354), which came from Tranquebar, is no longer in existence: nothing remains but the pin and the label. The species was, however, successfully recognized, as I believe, both by Chaudoir (Bull. Mosc. 1869, i. p. 386) and Bates (Ann. Mus. Civ. Gen. xxxii. 1892, p. 363), and there are specimens of it in the Prague Museum and in my own collection. All the specimens examined came from Burma.

XIX.—*Stray Notes on Mallophaga.*

By G. H. E. HOPKINS, M.A.*

1. *The Host of the Species described by Kellogg and Paine from "Desert Curlew."*

Kellogg and Paine (1911) described *Docophorus fissisignatus* (p. 19) and *Lipeurus epiphanes* (p. 21) from a "desert curlew" collected at Lagonillas, Bolivia. Having noted that the former species is clearly an *Ibidoecus* and the latter an *Ardeicola*, it was obvious that the host must be some species of ibis. Fortunately Kellogg and Paine note in their introductory remarks that the birds from which the lice were collected were obtained in 1901 by the late Perry O. Simons, a "collector of birds for the British Museum." At this point I referred the evidence to Miss T. Clay, who very kindly ascertained for me that the ibis collected by Mr. Simons at Lagonillas in 1901 is *Theristicus branickii* Berlepsch and Stolzmann ('The Ibis,' 1919, vol. i. ser. 11, p. 271). This bird is therefore the type-host of *Ibidoecus fissisignatus* (Kellogg and Paine) and of *Ardeicola epiphanes* (Kellogg and Paine).

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* Published by permission of the Director of Agriculture, Uganda.

2. *A wild Host of the Elephant-Louse.*

In his excellent account of *Hæmatomyzus elephantis* Piaget, Ferris (1931) states: "Apparently all the specimens thus far taken of this species have been from animals in captivity." He then notes that the species is evidently normal to the Indian elephant, and suggests that whether the original record from African elephant indicates anything more than a purely chance occurrence in a zoological garden remains to be determined. Bequaert's record (1930, p. 997) of *H. elephantis* on the African elephant was probably not published at the time when Ferris's paper was written, but even this was from a captive host at the Api elephant-farm. Furthermore, all the published records of this species of parasite, with one exception, are from young animals if the age of the host is mentioned at all.

It is therefore of interest to note that Mr. T. W. Chorley obtained *Hæmatomyzus elephantis* on two out of three wild adult male African elephants shot by him in Ankole district, Uganda. The louse was far from common, and all the specimens were found nearly hidden in small folds of the skin, especially in the neighbourhood of the shoulder. Mr. Chorley searched for the parasite on two other wild elephants which he shot in another district, but without success.

3. *Synonymy in the Genus* Acidoproctus.

Although *Acidoproctus* is a very small genus, the synonymy of the species has given much trouble, chiefly owing to the fact that many of the names were applied to immature specimens (often stragglers), but also owing to the rarity of specimens of the genus in collections.

Two very distinct members of the genus occur somewhat commonly in Africa, one on ducks of the genus *Dendrocygna* (*D. viduata* and *D. fulva*) and the other on *Alopochen ægyptiacus* (Nile goose) and *Plectropterus gambensis* (spurwing goose) Assuming for the moment that the specimens found on each pair of hosts are conspecific (as I believe them to be), I propose for the sake of convenience to refer to them in the following notes as the duck-species and the goose-species respectively; the reason for this will appear later I give below notes on the various names which have been used in *Acidoproctus*, followed by an amended synonymy for the three species which have been consistently confused and a description of one species which proves to have no valid name.

The types of the species described by Burmeister and by Rudow are still preserved in the Halle Museum, and Dr. S. Kéler has very kindly compared them with material sent to him by me, and thus enabled me to ascertain their identity. Piaget's types are in the British Museum, and during a brief visit there I compared them with my material; Miss T. Clay has been good enough to check and confirm the notes which I then made on these types.

Acidoproctus bifasciatus Piaget, 1878.—Described from a straggler on *Dromas ardeola* and subsequently identified by Piaget from *Dendrocygna viduata*. The type is a mature female of the "duck-species", the specimen described and figured by Piaget (1885, p 34, pl. iv. fig. 4) from *Dendrocygna viduata* is immature, and Piaget's statement that he had mistaken the sex of his original specimen is erroneous. There are no adult males among Piaget's material in the British Museum, but the adult females from *D. viduata* agree perfectly with the type and with specimens collected by myself from wild individuals of the same host. *Dendrocygna viduata* may be accepted as type-host of the species.

Acidoproctus kelloggi Carriker, 1902.—Described from material collected on *Nyroca valisineria* (Wilson) (=*Aythya vallisneria*, canvas-back duck) in Nebraska. I have not seen specimens, but it resembles *A. maximus* somewhat closely, and should be compared with that species; it seems not impossible that it is a straggler on *Nyroca* from *Dendrocygna arborea*.

Acidoproctus marginatus Piaget, 1878.—Described from an immature straggler on *Larus spinicauda*. The type is so immature that it is difficult to be certain what it is, but I can find no differences from equally young specimens of the "duck-species." The page-priority of this name over *bifasciatus* would be over-ruled by the immaturity of the type, but there is another still earlier name for this species.

Acidoproctus maximus Piaget.—Described from a series collected on *Dendrocygna arborea* from Rotterdam Zoo, and on *D. vagans* and *D. guttata* in the Leyden Museum. The specimens from *D. guttata* (which are not in the British Museum) are stated by Piaget to differ from the type, so may be left out of account. There is only one male (from *D. arborea*) in the British Museum, and I designate this (the specimen figured by Piaget) as holotype, thus automatically making *D. arborea* the type-host of *maximus*, which appears to be a valid species.

Acidoproctus rostratus (Rudow), 1866.—Although this species was described from a specimen collected on *Chenalopex ægyptiacus*, Dr. Kéler's comparison of the immature type with specimens of similar age collected by myself shows conclusively that it is a straggler of the "duck-species"; the name must therefore replace *bifasciatus* Piaget, as had already been suggested by Taschenberg and by Bedford. The fact that the type does not belong to the "goose-species" is surprising and disappointing, for straggling does not appear to be common in this genus in nature, and it leaves the "goose-species" without a valid name.

Acidoproctus stenopyx (Burmeister), 1838 (altered by Giebel to *stenopygos*).—Described from two males and a headless female found on *Fuligula rufina* (*Anas rufina*), and not yet known from any other host, all records except those based on the original series being mis-identifications. Dr. Kéler has compared my specimens of both the common African species with the types, and informs me that this species is certainly distinct from both.

From the above notes it is clear that the "goose-species" is without a valid name. I propose to supply this want by naming it *Acidoproctus taschenbergi*, in honour of the first author to make *rostratus* recognizable by figuring it and to suggest that it was what I have called the duck-species. The species, though undescribed, has been known for many years (usually under the misidentification *stenopygus* Nitzsch), and has been reasonably well-figured by Kellogg and Paine, I have, however, refrained from merely making my name a *nomen novum* for *stenopygus* Kellogg and Paine, 1902 (*nec* Nitzsch, 1867), partly because these authors did not describe the species, but chiefly because I do not know the whereabouts of their material.

The relevant synonymies are given below :—

1. *Acidoproctus stenopyx* (Burmeister), 1838.

Nirmus stenopyx Burmeister, Handbuch der Entomologie, ii. 1838, p. 428. On *Anas rufina*.

Nirmus stenopyx [Burmeister] Denny, Mon. Anopl. Brit. 1842, p. 151.

Lipeurus stenopygos Nitzsch, Giebel, Zeit. f. d. ges. Nat. xxviii. 1867, p. 386. Revival of Nitzsch's manuscript name.

Nirmus stenopygos Nitzsch, Giebel, Insecta Epizoa, 1874, p. 179, pl. viii. figs. 6, 7.

Akidoproctus stenopygus N. Piaget, Pédiculines, 1880, p. 212.

Akidoproctus stenopygos Nitzsch, Taschenberg, Die Mallophagen, 1882, p. 107, pl. vii. fig. 4.

Akidoproctus stenopygus Nitzsch, Kellogg, Genera Insectorum, Mallophaga, 1908, p. 35.

Acidoproctus stenopygus Nitzsch, Harrison, Parasitol. ix. 1916, p. 128.

Type-host: *Netta rufina* (Pallas) (red-crested pochard).

2. *Acidoproctus rostratus* (Rudow), 1866.

Ornithobius rostratus Rudow, Zeit. f. d. ges. Nat. xxvii. 1866, p. 465. On *Chenalopex ægypticus* [straggler].

Ornithobius rostratus Rudow, Beitrag z. Kenntniss d. Mallophagen, 1869, p. 46.

Ornithobius rostratus Rudow, Zeit. f. d. ges. Nat. xxxvi. 1870, p. 141.

Lipeurus rostratus Rudow, Giebel, Insecta Epizoa, 1874, p. 145.

Acidoproctus marginatus Piaget, Tidj. v. Ent. xxi. 1878, p. 179, pl. 12, fig. C. On *Larus spinicauda* [straggler].

Acidoproctus bifasciatus Piaget, *l. c.* p. 181, pl. xii. fig. G. On *Dromas ardeola* [straggler].

Akidoproctus marginatus Piaget, Pédiculines, 1880, p. 209, pl. xvii. fig. 4.

Akidoproctus bifasciatus Piaget, *l. c.* p. 210, pl. xvii. fig. 5.

Ornithobius rostratus Rud., Piaget, *l. c.* p. 379,

Akidoproctus rostratus Rudow, Taschenberg, Die Mallophagen, 1882, p. 197, pl. vii. fig. 3. (Figures it from type and thinks it the same as *marginatus*.)
Akidoproctus bifasciatus Piaget, Kellogg, Genera Insectorum, Mallophaga, 1908, p. 35, pl. i. fig. 6.
Akidoproctus marginatus Piaget, Kellogg, *l. c.* p. 35.
Ornithobius rostratus Rudow, Kellogg, *l. c.* p. 51.
Acidoproctus bifasciatus Piaget, Harrison, Parasitol. ix. 1916, p. 128.
Acidoproctus marginatus Piaget, Harrison, *l. c.* p. 128 *.
Acidoproctus bifasciatus Piaget, Bedford, 5th and 6th Repts. Dir. Vet. Res. S. Africa, 1919, p. 729.
Acidoproctus marginatus Piaget, Bedford, 18th Rept. Dir. Vet. Ser. & Anim. Indust. S. Africa, 1932, p. 333.
Acidoproctus rostratus (Rudow), Bedford, *l. c.* p. 523.

Type-host: *Dendrocygna viduata* (Linn.) (white-faced tree-duck). There is no doubt whatsoever that Rudow's unique type was a straggler; *D. viduata* is the first recorded host on which the species occurs normally in nature.

3. *Acidoproctus taschenbergi*, sp. n.

Akidoproctus stenopygus "Nitzsch," Kellogg and Paine, Bull. Ent. Res. ii. 1911, p. 148, pl. v. fig. 6. On *Plectropterus gambensis*, Khor Felos, Egyptian Sudan. Misidentification.
Acidoproctus stenopygus "Nitzsch," Bedford, 5th and 6th Repts. Dir. Vet. Res. S. Africa, 1919, p. 729.
Acidoproctus stenopygus "(Nitzsch)," Bedford, 15th Rept. Dir. Vet. Ser. S. Africa, 1929, p. 528.
Acidoproctus rostratus "(Rudow)," Bedford, 18th Rept. Dir. Vet. Ser. & Anim. Indust. S. Africa, 1932, p. 333. Misidentification.
Acidoproctus stenopygus "(Nitzsch)," Bedford, *l. c.* p. 523.

The species may be described as follows:—

General appearance as in *stenopyx*, but much broader in proportion and sides of abdomen more convex. White with small blackish markings which are chiefly marginal. *Head* with emargination broad and usually narrower distally than proximally, more rarely straight-sided or strongly narrowed distally. Lobes bordering emargination much broader than in *stenopyx*, bearing five slender setæ on their outer margins. Margins of temples with a series of six or seven very small and inconspicuous setæ. Occipital margin sinuate, strongly convex at sides, nearly straight in the centre. Whole head almost colourless except for the mandibles and a pair of small black spots, near the occipital border, whose shape is

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* For some unexplained reason Harrison sinks *rostratus* as a synonym of the much later *marginatus*.

well shown in the figure *. Shape and chætotaxy of *thorax* as in the figure, but posterior margin of pterothorax without the distinct median projection there shown. Posterior margin of prothorax strengthened by a pair of rod-shaped incrassations, with broadened ends, which extend obliquely in a disto-central direction almost from the outer margin. Pterothorax with a pair of somewhat quadrate sclerotic blotches just proximal to the base of the middle leg. *Abdomen* and modified segments of female as in the figure. Sexual differences as in *stenopyx*.

Measurements (*in millimetres*).

	Male.	Female.
Head, length	0·84	0·89
,, breadth........	0·79	0·84
Abdomen, length	2·32	2·41
,, breadth ...	1·07	1·12
Total length	3·25	3·92

The abdomen is the broadest part of the insect.

Male holotype and female allotype collected on *Alopochen ægyptiaca* (Linn.), Nile goose, on Nsadzi Island, Lake Victoria, Uganda, by T. W. Chorley, November 1932. Numerous paratypes collected from the same host-species in several localities in Uganda and Sudan by Mr. Chorley and others. Holotype and allotype presented to the British Museum, paratypes in several collections, including that of the writer.

4. *The Identity of* Goniodes aliceps *Nitzsch*.

The name *Goniodes aliceps* Nitzsch was first published by Giebel in 1867 as a *nomen nudum*; its validity dates from 1874, when Giebel published a description of it. Taschenberg, in 1882, published a more complete description of it and figured the type; he assumed it to be the male of *G. oniscus* Nitzsch, and sank the latter name, although it has eight years priority. He made *aliceps* the genotype of his new genus *Rhopaloceras*. Harrison, 1916, accepted this erroneous synonymy with the exception that he restored the name *oniscus*, and Carriker has also accepted it in his monograph on the lice of the Tinamidæ.

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* References to the figure are to that published by Kellogg and Paine.

But Carriker notes of this species: "Taschenberg has published a very good figure of a *Rhopaloceras* which he has called *aliceps* (=*oniscus*), but if he has given an approximately correct delineation of the genital armature the specimen from which the drawing was made is either not *aliceps* or else the type of *aliceps* was not taken from *Tinamus tao*, the genital armature being of a type very distinct from that of the parasite I have taken on that host, and approximates the genital armature of *R. genitalis simplex*, from *Tinamus major castaneiceps*."

Carriker's remark is a testimony both to his own knowledge of the Mallophaga of the Tinamidæ and to Taschenberg's figure (drawn from the type of *aliceps*), for this type (as a more careful reading of either Giebel or Taschenberg would have informed him) was not from *Tinamus tao* but from *Tinamus* "*macrourus*" from Brazil. As Clay (1937) has shown, this name refers to *T. major major*, and it is to be expected that the *Rhopaloceras* found on this host will be very close to, if not identical with, *R. genitalis simplex* Carriker, described from another form of the same species. *R. oniscus* (Nitzsch) is almost certainly the form described and figured by Carriker under this name from the original host, but *simplex* and *genitalis* Carriker must be placed as subspecies of *aliceps* instead of as forms of *genitalis*.

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XX.—*On a new Genus of the* Pleurogenetinæ (Lecithodendriidæ, *Trematoda*) *from a Kingfisher.* By B. P. Pande, Zoology Department, University of Allahabad, India.

In this paper is described a new genus *Basantisia*, within the subfamily Pleurogenetinæ, to contain a new species, *B. ramai*, from an Indian Kingfisher, *Ceryle raddis leucomanara*. This genus falls into the group of those genera in the Pleurogenetinæ, which, according to the useful keys given by Mehra (1935) and Macy (1936) for the identification of the genera in this subfamily, are characterized by short intestinal cæca, subequal suckers, genital pore near acetabular zone, and post-acetabular uterus. *Basantisia* is distinguished from all such genera in the position of its genital pore, ovary, testes, cirrus-sac, and vitellaria.

Basantisia ramai, gen. et sp. n.

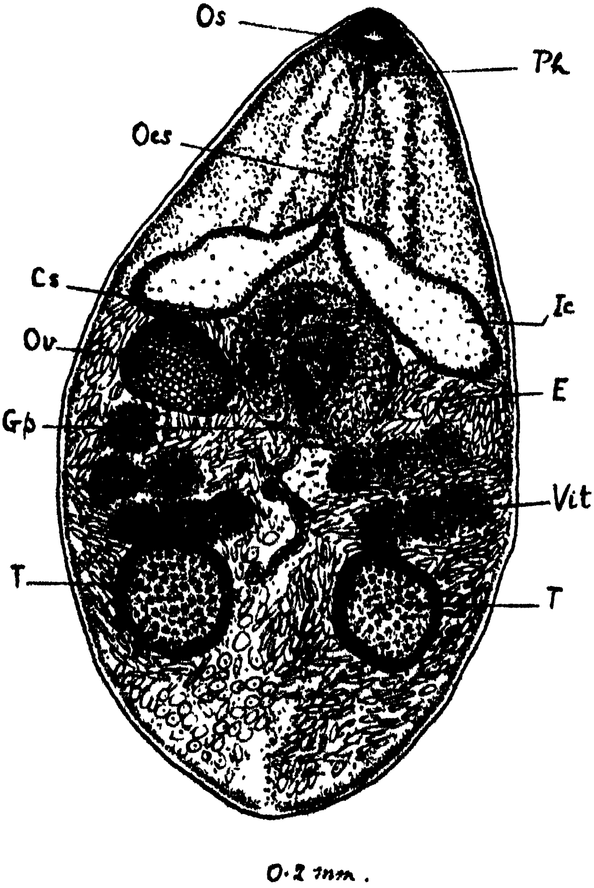
Host.—*Ceryle raddis leucomanara.*

Habitat.—Small intestine.

Locality.—Allahabad.

Description.—Body nearly pyriform, with anterior end somewhat attenuated, 0·64 in length, 0·38 in maximum breadth in the middle across the region of anterior vitelline follicles, aspinose. Oral sucker subterminal, 0·038 × 0·04 in size; prepharynx well developed; pharynx nearly globular, 0·024 in diameter; œsophagus long, 0·087 in length, dividing into intestinal cæca at one-fourth of body-length from anterior end; intestinal cæca short, saccular, diverging laterally somewhat obliquely, terminating at about the middle of the acetabulum. Acetabulum slightly larger than oral sucker, situated a little in front of middle of body-length, 0·06 × 0·05 in size. Excretory pore terminal, excretory bladder V-shaped. Genital pore slightly sinistral, immediately behind acetabulum. Testes symmetrical, placed near body-margins at middle of posterior half of body, nearly rounded, with entire margins; left testis 0·087 × 0·09 in size and right 0·09 × 0·098; cirrus-sac large, curved in a horseshoe-shaped manner around acetabulum with its proximal and distal ends near one another immediately behind the acetabulum ; vesicula seminalis large, tubular, with its walls in contact with those of the cirrus-sac, occupying nearly half the length of the cirrus-sac ; pars prostatica well developed, oval ; ductus ejaculatorius long and narrow ; prostate gland cells numerous, occupying space between pars prostatica, ejaculatory duct, and

Fig. 1.

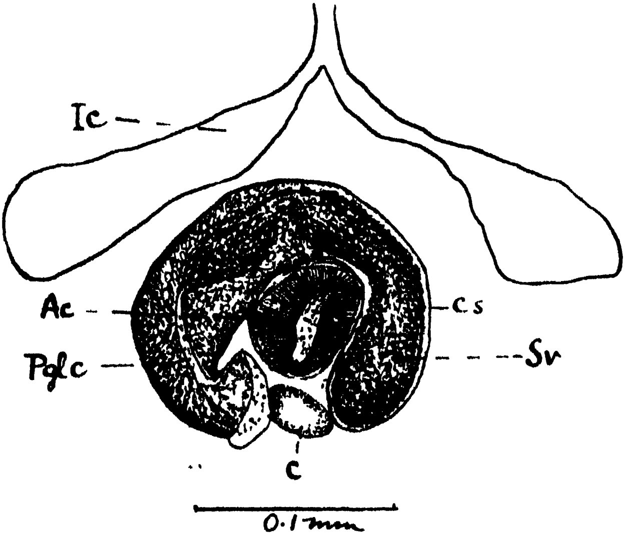


Basantisia ramai, gen. et sp. n., ventral view.

Ac, acetabulum ; *C*, cirrus ; *Cs*, cirrus-sac ; *E*, egg ; *Gp*, genital pore ; *Ic*, intestinal cæcum ; *Oes*, œsophagus ; *Os*, oral sucker ; *Ov*, ovary ; *Pglc*, prostate gland-cells ; *Ph*, pharynx ; *Pp*, pars prostatica ; *Sv*, seminal vesicle ; *T*, testis ; *Vit*, vitellaria.

cirrus-sac ; cirrus eversible. Ovary pretesticular, dextral, close behind right intestinal cæcum, just outside the cirrus-sac, in acetabular zone, broader than long, somewhat ovoid in shape, 0·07 × 0·09 in size ; receptaculum seminis absent ; a few diffuse shell gland-cells near genital pore ; vitellaria composed of 6–8 large follicles on each side, lateral, extending from immediately in front of testes to the level of hinder border of ovary ; uterus occupying the available space behind intestinal cæca, individual coils not discernible ; ripe eggs 0·021 in length and 0·0105–0·011 in breadth.

Fig. 2.



Acetabulum and cirrus-sac with everted cirrus of *B. ramai.* For lettering see fig. 1.

Remarks.—The above description will make it evident that the trematode from the Kingfisher belongs to the subfamily Pleurogenetinæ on account of the short intestinal cæca not extending posterior to the acetabulum, V-shaped excretory bladder, sinistral genital pore, general topography of organs, and well-developed cirrus-sac. From a study of this subfamily it appears that these flukes represent not only a new species, but must be regarded as the type of a new genus. In the Pleurogenetinæ, Mehra (1935) has included the genera *Pleurogenes* Looss (1896), *Prosotocus* Looss (1899), *Brandesia* Stossich (1899), *Ganeo* Klein (1905), *Parabascus* Looss (1907), *Limatulum* Travassos (1921), *Mosesia* Travassos (1928), *Cryptotropa* Strand (1928) (Syn. *Cryptotrema* Ozaki, 1926), *Postorchigenes* Tubangui (1928), *Mehraorchis* Srivastava (1934), and *Pleuropsolus* Mehra (1935). In a recent paper Macy (1936) has added to this subfamily a new genus, *Glyptoporus*, and *Loxogenes* Krull (1933), *Pleurogenoides* Travassos (1921), *Phaneropsolus* Looss (1899), *Loxogenes* Stafford (1905), and all the genera listed by Mehra except *Ganeo*, *Mehraorchis*, and *Pleuropsolus*. The genus *Loxogenes* has been held to be untenable by Srivastava (1934), who has also dropped the genus *Pleurogenoides*. Mehra has included *Phaneropsolus* in his subfamily Phaneropsolinæ. Therefore, the only genus to be added to the list of Mehra from that of Macy is *Glyptoporus*.

Among the various genera hitherto known in the Pleurogenetinæ the points of difference lie in the following characters:—Extent of intestinal cæca, position of genital pore, position of testes, position and character of cirrus-sac, position of ovary and vitellaria. The new genus, *Basantisia*, shows relationships to such genera as *Mosesia*, *Limatulum*, *Pleuropsolus*, *Brandesia*, and *Glyptoporus* in the short length of its intestinal cæca and position of the genital pore in the neighbourhood of the acetabulum. From *Mosesia* (parasitic in birds), with which the new genus shows greater resemblance on account of the position of its ovary and testes, it differs remarkably in the position of its genital pore (in *Mosesia* the genital pore is anterior to the acetabulum), and the position of the cirrus-sac and the vitellaria. In *Limatulum* (parasitic in bats) the genital pore is lateral to the acetabulum, whereas it lies close behind it in *Basantisia*, gen. nov. The position of the testes, cirrus-sac, uterus, and vitellaria also differ in the two genera. *Pleuropsolus* (*P. insolens* Bhalerao, 1926, the type-species parasitic in crow) is distinguished from the new genus by the position of its genital pore close in front of the acetabulum, and the precæcal vitellaria. In *Brandesia* (parasitic in frogs) the post-acetabular genital pore is marginal and the testes are pre-acetabular and situated in the anterior half of the body with the ovary behind them. In *Glyptoporus* (parasitic in bat) the genital pore lies anterior to acetabulum, with the testes and ovary in level with it. The cirrus-sac is also mostly lateral to the acetabulum, and the vitellaria lie between the cæca and the oral sucker.

BASANTISIA, gen. nov.

Generic Diagnosis.—Small-sized Pleurogenetinæ, with small suckers, acetabulum slightly larger than oral sucker and immediately pre-equatorial, and aspinose cuticle. Intestinal cæca short, sac-shaped, extending to about middle of acetabulum. Excretory bladder V-shaped. Genital pore close behind acetabulum, slightly sinistral. Testes nearly rounded, symmetrically arranged at middle of posterior half of body; cirrus-sac large, horseshoe-shaped around acetabulum. Ovary pre-testicular, dextral, in acetabular zone; receptaculum seminis absent; shell-gland mass diffuse, near genital pore; vitellaria of large follicles, lateral, in the region between testes and ovary; uterus filling post-cæcal part of body; eggs 0·021 in length and 0·0105–0·011 in breadth.

Type-species, *B. ramai*, sp. n.

All measurements are in mm.

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XXI.—*A new Corsican Trichopteron.*

By MARTIN E. MOSELY, F.R.E.S., F.Z.S.

Philopotamus corsicanus, sp. n. (Figs. 1–3.)

Philopotamus ludificatus Esb. Peters. *nec* McLach. En. Med. x. p. 25, 1913.

Philopotamus siculus Mosely, *nec* Hagen, Eos, vi. pp. 168–169, 183, 1930; *op. cit.* vii. p. 180, 1932.

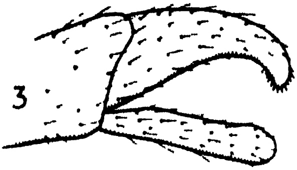
Philopotamus siculus Berland & Mosely *nec* Hagen, Cat. Fr. Trich., Ann. Soc. Ent. Fr. cvi. p. 150, 1937.

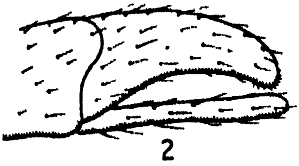
During two visits to Corsica, in 1928 and 1931, I obtained a long series of a *Philopotamus* which I associated with *P. siculus* Hagen, having regard to the worn and dull appearance of the wings, which seemed to conform with McLachlan's description of this species in his 'Revisional Monograph,' p. 385, 1877.

Recently, I have had an opportunity of examining McLachlan's collection, which includes three of the four examples of *siculus* which he mentions as from Messina, 30th March.

I am now satisfied that the species I had before me is distinct from *siculus*, both in neuration and also in the form of the inferior appendages.

McLachlan states of *siculus* that it is related to *montanus*, and the upper branch of the second joint of the appendage is broad ; he adds that apical fork no. 4 of the anterior wing has a long foot-stalk.





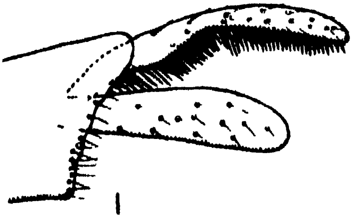


Fig. 1.—Inferior appendage of *Philopotamus corsicanus*, sp. n.
Fig. 2.—The same of *P. siculus* Hagen.
Fig. 3.—The same of *P. montanus* Don.

In *corsicanus* the upper branch of the terminal joint of the inferior appendage is narrow, and the foot-stalk of fork no. 4 of the anterior wing is not so long as in *siculus*, and in some examples even sessile.

Corsica : Corte, 21. v.–5. vi. 1928 ; Vizzavona, 13. vii.–5. ix. 1931. Corsica : in Esben Petersen's collection.

Type ♂ in the author's collection, now lodged in the British Museum. Numerous paratypes from the same localities, in the author's and the collection of the British Museum, and one male in Esben Petersen's collection.

This correction entails the removal of *P. siculus* from the list of French Trichoptera.

XXII.—*Some Ordovician Bryozoa (Polyzoa) from Akpatok Island.*

By Kenneth P. Oakley, B.Sc., Ph.D., F.G.S., Department of Geology, British Museum (Natural History).

[Plates VII.–IX.]

The specimens described in the present paper were collected by Mr. Ian Cox from Ordovician limestones on Akpatok Island, Ungava Bay, Canadian North-Western Territories, during the Oxford University Expedition to Hudson Straits in 1931. They have been deposited in the Sedgwick Museum, Cambridge. The author is greatly indebted to Mr. Cox for the privilege of examining and describing this material.

The correlation of the beds from which the specimens were obtained has been discussed by Foerste and Cox (1936) *. It is thought that the greater part of the Akpatok limestones will prove to be equivalent to the Red River formation of Manitoba (the so-called "Manitoba Trenton"): see Cox, 1937, p. 5. The stratigraphy and faunas of the Akpatok formation have been summarized in an earlier paper by Cox (1936, p. 29).

Order CYCLOSTOMATA Busk.

Family **Ceramoporidæ** Ulrich.

Genus Ceramoporella Ulrich, 1882.

Genotype: *Ceramoporella distincta* Ulrich.

Ceramoporella cf. *ohioensis* (Nicholson).

(Pl. VII. figs. 1, 2.)

[Synonymy of *Ceramoporella ohioensis* (Nicholson):

Ceramopora Ohioensis Nicholson, 1875, Pal. Ohio, ii. p. 265, pl. 25, figs. 10 *a*, 10 *b*, 10 *c*.

Ceramoporella ? ohioensis Ulrich, 1890, Geol. Surv. Illinois, viii. p. 466, pl. 39, fig. 2, 2 *a*.

Ceramoporella ohioensis Cumings, 1907, 32nd Ann. Rep. Dep. Geol. Nat. Res. Indiana, p. 800, pl. xi. fig. 4–4 *g*.]

Material.—Transverse and vertical sections of a single zoarium (A 14902 *a–b*) † embedded in a piece of limestone.

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* For references see list of literature at end of article.

† The numbers quoted under "*Material*" throughout the paper refer to the catalogue of the Sedgwick Museum, Cambridge.

Description.—The zoarium is a thin lamellate expansion, 0·4–0·6 mm. thick and 7 mm. in diameter, consisting of a single layer of rather oblique zoœcia with a few intercalated mesopores. The zoœcia arise from an irregularly undulating basal lamina. Although unattached, the general form suggests an originally encrusting habit.

The zoœcia are tubular, with fairly thin walls; after passing through a relatively long prostrate stage they pursue a sub-erect course to the surface. The hoop-like structures showing at the base of the vertical section (Pl. VII. fig. 1), on the left-hand side, are cross-sections of the prostrate portions of the zoœcia. Diaphragms are absent.

In the transverse section (Pl. VII. fig. 2), which is approximately tangential to the surface of the zoarium, the zoœcia show elongate pyriform outlines, with an average length of 0·35 mm. and an average width of 0·17 mm. The lunaria are very distinct, being formed of clearer tissue than the rest of the zoarium, and each has the form of an acute-angled boomerang. The lunarial notch is often slightly deflected from the long-axis of the zoœcial aperture, which consequently assumes an auriculate outline. In some areas the zoœcia are arranged in roughly diagonal lines. Along these lines the zoœcia are generally contiguous, but the intervening spaces adjacent to the lunaria are occupied by quadrangular mesopores. Measured along a diagonal line there are normally six to seven zoœcia in 2 mm. In one portion of the transverse section, probably a macular area, the mesopores appear to be largely plugged with auxiliary ectocyst, while the zoœcia show little trace of regular arrangement.

Horizon.—Ordovician; limestones exposed at mean sea-level on Akpatok Island. The associated fauna included *Streptelasma robustum* Whiteaves, *Streptelasma arcticum* Wilson, *Calapœcia canadensis* var. *ungava* Cox, *Pachydictya coxi*, sp. n., *Diplotrypa petropolitana ungava*, var. n., *Eridotrypa* sp., *Rhynchotreta capax* (Conrad) and *Illænus grœnlandicus* Troedsson. The bed should probably be included with that part of the Akpatok limestone group which has been correlated with the Nelson River formation of the Hudson Bay region (Foerste and Cox, 1936, p. 305). The presence of *Streptelasma robustum* at this horizon indicates equivalence also with a horizon in the lower part of the Red River formation of Manitoba (*ibid.* p. 289).

Remarks.—There is little doubt that this bryozoan is very close to *Ceramoporella ohioensis* (Nicholson), a species which occurs typically in Richmond strata of areas adjacent to the Cincinnati axis. Its zoœcia are, however, slightly smaller on the average than is usual in that species, and the mesopores are somewhat less regular in shape and distribution. Nevertheless, the transverse section of the Akpatok specimen bears a close similarity to one of a topotype of *C. ohioensis* figured by Cumings 1907, pl. xi. fig. 4).

Genus SPATIOPORA Ulrich, 1882.

Genotype : *Spatiopora aspera* Ulrich.

Spatiopora cf. *lineata* var. *incepta* Ulrich. (Pl. VII. fig. 3.)

[Synonymy of *Spatiopora lineata* Ulrich var. *incepta* Ulrich :
Spatiopora maculosa var. *incepta* Ulrich, 1893, Geol. Nat. Hist. Surv. Minnesota, iii. p. 320.
Spatiopora lineata-incepta Nickles and Bassler, 1900, Bull. U.S. Geol. Surv. clxxiii. p. 407.
Spatiopora lineata incepta Bassler, 1911, U.S. Nat. Mus. Bull. lxxvii. p. 107, pl. 7, figs. 9 and 10.
Spatiopora lineata incepta Ruedemann, 1925, N.Y. State Mus. Bull. cclxii. p. 90.]

Material.—Single zoarium (A 6761 *a–b*) encrusting the surface of a lamina of calcareo-phosphatic material, probably the exocyst of a large trilobite.

Description.—The zoarium forms an extremely thin encrusting sheet. The zoœcia, which are short and subdirect, arise from a slightly undulating basal lamina, and have apertures varying in outline from polygonal to round or oval. They are disposed in intersecting arcuate rows, the resulting arrangement of apertures being in some areas roughly quincuncial. Measured along one of the rows there are approximately six zoœcia in 2 mm. The zoœcia vary in diameter from 0·25 to 0·5 mm., but 0·35 mm. may be taken as the average dimension.

The surface of the zoarium is smooth except for low, blunt eminences at many of the wall-intersections. The surface is diversified by regularly spaced, but inconspicuous maculæ—circular areas about 2 mm. in diameter, consisting of zoœcia larger than the average. Mesopores are absent or infrequent. The zoœcial walls are moderately thick, and in thin-section exhibit the granular, clouded appearance common to most Ceramoporoid forms.

Horizon.—Ordovician; calcite-mudstones exposed at an elevation of 400 feet above mean sea-level, Akpatok Island. The associated fauna included *Calapœcia canadensis* Billings, *Ceraurus* sp., and *Illænus grœnlandicus* Troedsson. This horizon is 50 feet below the bed with *Shamattawaceras* cf. *ascoceroides*, and should probably be included with the underlying beds, correlated with part of the Nelson River formation.

Remarks.—The arrangement of the zoœcia in longitudinal series is characteristic of the *S. lineata* species-group. The Akpatok form agrees with the typical *S. lineata* Ulrich in the size of its normal zoœcia, but is distinguished by the possession of maculæ consisting of groups of zœocia larger than the average. It agrees most closely with *S. lineata* var. *incepta* Ulrich. Comparing it with the description and figure of a hypotype * of this variety from the Ordovician of Esthonia (Bassler, 1911, p. 107), the only notable differences seem to be the slightly greater thickness of the walls in the Akpatok form, and the occurrence of six zoœcia in 2 mm. as against five in that interval in the Esthonian form.

S. lineata var. *incepta* is found in the Upper Decorah Shales of the Black River group at Chatfield, Minnesota, and in the Wesenberg Limestone of Esthonia (Bassler, 1915, p. 1166). The Wesenberg Limestone belongs to the *E* Division of Schmidt, which is correlated by Bulman (1932, p. 3) with part of the Ashgillian Series of the British Province. Apparently it is not uncommon for the arctic elements of the American Black River fauna to re-appear at higher horizons, as for example in the Richmond (Foerste, 1924, p. 13).

Spatiopora is characterized by a parasitic habit, and its species are usually found attached to shells of *Orthoceras*, or more rarely to those of smooth-shelled gastropods. The present example, however, is encrusting a sheet of calcareo-phosphatic material which is certainly not molluscan, although there is every reason to suppose that it is organic skeletal material of some sort. Dr. Madeleine Fritz has suggested that it may be part of the pygidium of one of the giant Asaphid trilobites belonging to the genus *Isotelus*. It may be noted that in the Dundas formation of the Credit River section, Toronto, fragments of *Isotelus* are frequently found encrusted with another parasitic bryozoan, *Stigmatella sessilis* var. *crassa* (Dyer, 1925, p. 61).

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* A specimen used for an extended description of a species (Frizzell, 1933, p. 653).

In the Akpatok specimen the walls of the *Spatiopora* and the lamina which it encrusts are alike minutely punctated. As the specimen was collected from a weathering-face there seems no doubt that the punctations are due to the corroding action of recent lichen.

Order TREPOSTOMATA.

Family **Batostomellidæ.**

Genus Eridotrypa Ulrich, 1890.

Genotype: *Eridotrypa mutabilis* Ulrich (=*Cladopora ædilis* Eichwald).

Eridotrypa sp. (Pl. VII. figs. 4, 5.)

Material.—Fragmentary branches of zoaria embedded in limestone. Thin-sections, A 14903 *a–e*.

Description.—Zoarium ramose, but bifurcations apparently remote. Branches cylindrical and extremely slender, the maximum diameter observed being 1 mm. It is possible that all the branches seen are young.

Longitudinal sections: in the axial zone the zoœcial tubes are narrow and have thin, rather flexuous walls; in the peripheral zone their diameter increases and the walls become greatly thickened by auxiliary ectocyst. The latter is clear in comparison with the primary wall, which has a dark and somewhat granular appearance. The zoœcia open obliquely. The zoœcial tubes are crossed by straight diaphragms. The frequency of these in the axial region is variable. They are usually closely spaced in the proximal part of the mature zone, but tend to be infrequent in the more distal parts of the zoœcia.

Tangential sections: the zoœcia show slightly elongate polygonal outlines, but the ring-like thickening of the walls by auxiliary ectocyst has reduced the actual orifices to a circular or oval form. There are six to eight zoœcial apertures in a distance of 2 mm. measured longitudinally. Minute acanthopore-like structures can be detected at many of the wall-junctions. A few shallow mesopores are also present locally, and in some tangential sections show as small quadrangular spaces at the angles of the zoœcia. It is probable that mesopores are confined to maculæ, since in some tangential sections they cannot be detected at all.

Horizon.—Ordovician ; limestones exposed at mean sea-level, Akpatok Island. Found in the piece of limestone which contained *Ceramoporella* cf. *ohioensis* and *Pachydictya coxi* (see p. 207).

Remarks.—The material is too scrappy for specific determination, but it is probable that this bryozoan is closely allied to the genotype, *E. ædilis* (Eichwald), an extremely variable Middle Ordovician species occurring abundantly in the Wesenberg Beds (*E*) of Esthonia and in Black River and Trenton strata of North America.

Family **Trematoporidæ** (?).

Genus DIPLOTRYPA Nicholson, 1879.

Genotype : *Favosites petropolitanus* Pander.

Diplotrypa petropolitana (Pander)[*] var. *ungava*, nov.

(Pl. VIII. figs. 6, 7 ; Pl. IX. fig. 8.)

[Cf. *Mesotrypa prolifica* Fritz in Parks, 1928, Trans. Roy. Soc. Canada, sect. iv. 22, pp. 76 78, figs. 22, 23, pl. i. fig. 28 ; and *Diplotrypa petropolitana* var. *prolifica* Sproule, 1936, Canada Dep. Mines, Mem. ccii. p. 107.]

Material.—***Holotype*** **of variety, a single zoarium embedded in calcite-mudstone, now represented by a fragment (A 6760 *a*) and five thin-sections (A 6760 *b-f*).**

Description.—**Zoarium tending to be sub-hemispherical, but with sinus on one side ; about 12 mm. thick and with a maximum diameter of about 37 mm. Upper surface smooth with inconspicuous, but regularly distributed, monticules formed of zoœcia larger than the average. The interval between the centres of the monticules is approximately 7 mm. Lower surface not preserved.**

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[*] The interpretation of Pander's species put forward by Nicholson (1879, p. 133) is here followed.

Tangential sections (Pl. VIII. fig. 6; Pl. IX. fig. 8) show that the zoœcial tubes are prismatic. In an intermonticular area seven to eight zoœcia occur in an interval of 2 mm.; they vary in diameter from 0·2 to 0·3 mm. In the monticules, where the zoœcia have a diameter up to 0·4 mm., there are four to five in 2 mm. This gives an average distribution of five to six zoœcial apertures in 2 mm. Each zoœcium makes point-contact with from two to four neighbouring zoœcia. The interzoœcial spaces are occupied by angular mesopores. The walls of adjacent zoœcia are rarely separated by more than a single row of mesopores.

In vertical sections (Pl. VIII. fig. 7) the walls of the zoœcia are found to be uniformly thin throughout. The zoœcial tubes are long, and crossed by diaphragms which are usually slightly oblique, but may be curved, and which are regularly spaced at an average interval of slightly less than a tube-diameter. Where two zoœcial tubes are contiguous the common wall is straight, but where a mesopore intervenes the wall which is common to the mesopore is usually moniliform. The mesopores have a diameter varying from 0·04 mm. to 0·15 mm. They have diaphragms separated by intervals varying from a third of the tube-diameter to a whole tube-diameter, so that they are more closely tabulated than the zoœcia. The diaphragms in contiguous mesopores usually alternate, while the common wall tends to be zig-zag. There is a marked tendency for some of the mesopores to change into zoœcia in the mature region of the zoarium.

Horizon.—Ordovician; limestones exposed at mean sea-level, Akpatok Island. For associated fauna and correlation of the bed see under *Ceramoporella* cf. *ohioensis* (p. 207).

Remarks.—This bryozoan agrees very closely with *Mesotrypa prolifica* Fritz, described from the Lower Collingwood Shales (Trenton) of Ontario. It is, however, included in the genus *Diplotrypa* for two reasons: first, it lacks the only feature which might possibly justify the reference of the Ontario form to *Mesotrypa* rather than to *Diplotrypa*, namely the pinching out of the mesopores in the mature zone; and on the other hand, it exhibits the tendency for the mesopores to change into zoœcia, which is observable in most species of *Diplotrypa*, but not apparently in *Mesotrypa*. Dr. Madeleine Fritz (1928, p. 78) was alive to the apparent affinities between the species of "*Mesotrypa*" which lack acanthopores and species of the *Diplotrypa petropolitana* group—affinities which if real would cut across the established family classification. The present form might be regarded as providing yet another link between the two genera.

Typical species of *Mesotrypa* are distinguished from *Diplotrypa* by (i.) the presence of acanthopores, (ii.) the regular pinching out of mesopores in the mature zones, and (iii.) the presence of numerous curved diaphragms. Such forms, however, appear to grade into other groups of species in which acanthopores are absent, so that the presence of these structures has come to be regarded as an inconstant feature of *Mesotrypa*. The third character is not a sound criterion in itself, since *D. petropolitana* frequently shows a number of curved diaphragms (*cf.* Bassler, 1911, p. 314, figs. 193 *c*, *d*, and *e*). The Ontario species is without acanthopores, and was referred to *Mesotrypa* mainly on the basis of the pinching out of the mesopores. The Akpatok form lacks even that feature, and yet is indistinguishable otherwise from *M. prolifica*. This raises the question of whether it would not be sounder systematics to include in *Mesotrypa* only forms which agree with the genotype in having acanthopores. The possession of acanthopores is more likely to have been a static character in the evolution of Trepostome lineages than the other features which have been regarded as distinctive of *Mesotrypa*.

The new variety differs from Pander's species (as interpreted by Nicholson) in the smallness of the zooecia and mesopores. In the typical form there are on the average three-and-a-quarter to four zooecia in an interval of 2 mm., whereas in the present one the average distribution is five to six in the same distance. The Akpatok form differs from *D. petropolitana* var. *prolifica* in the failure of the mesopores to show any tendency to pinch out in the mature zone. Unless this feature can be shown to have been controlled by some environmental factor it seems advisable to regard the Akpatok and the Ontario forms as distinct varieties.

Diplotrypa petropolitana ranges throughout the Middle Ordovician of the Baltic Provinces. The variety *prolifica* is typical of the Coburg formation (Trenton) of Ontario.

Order CRYPTOSTOMATA.

Family **Rhinidictyonidæ**.

Genus PACHYDICTYA Ulrich, 1882.

Genotype: *Pachydictya robusta* Ulrich.

Pachydictya coxi, sp. n. (Pl. IX. figs. 9–12.)

Material.—Part of a zoarium weathered out on the surface of a piece of limestone, together with numerous fragments revealed in thin-sections of the rock. *Holotype*: A 6759 *a–c*; *Paratypes*: A 6759 *d–i*.

Description.—Narrow bifoliate zoarium arising from a rounded, tapering base, and branching dichotomously. Branching is apparently infrequent; only one actual bifurcation was found, the greater part of the material consisting of short lengths of straight unbranched fronds. The branches, or fronds, are parallel-sided, elliptical in cross-section, and have acute non-poriferous edges. They show a maximum width of 2 mm., and a maximum thickness of 0·7 mm. The zoœcial apertures, which are elongate ovals (average longer axis 0·35 mm.; average shorter axis 0·13 mm.), are surrounded by narrow peristomes. The zoœcia open directly on the surface, and their apertures are arranged in alternating longitudinal rows, of which there are five or six on each of the surfaces of the branch. Measured along a vertical row there are three-and-a-half to four apertures in an interval of 2 mm. The zoœcial interspaces are solid, and bear a faint granulose ornament. A fine flexuous ridge can be detected running longitudinally between each pair of apertural rows

Transverse sections through the zoarial branches (Pl. IX. figs. 9, 11, 12) show a duplex mesial lamina enclosing relatively large median tubuli. In the mature branch, shown in Pl. IX. fig. 9, the tubuli have a diameter of 0·017 mm. and are placed at an average interval of 0·1 mm.; in young branches the spacing is closer. The zoœcial tubes are without diaphragms. In section the interzoœcial spaces are seen to be largely filled with solid calcareous tissue, although in some cases there are indications of open vesicular tissue below this. The solid tissue is traversed by tenuous ribbon-like laminæ which radiate outwards in bundles and run longitudinally between the rows of zoœcia. Their "outcrop" forms the flexuous ridge already referred to. They probably enclose exceedingly minute tubuli (*cf.* Bassler, 1911, p. 138, fig. 61 *b*), which would account for the fine pustulations observed on the interspaces. The tangential section (Pl. IX. fig. 10 *a*) reveals the rings of clear auxiliary ectocyst which form the peristomal thickening of each zoœcial opening; the traces of the bundles of interzoœcial laminæ show as dark flexuous lines between the vertical rows of zoœcial apertures. The tangential section also shows a very interesting feature which is regarded as characteristic of the species—namely, the regular association of a pair of minute oval "cells" (? acanthopores) with each zoœcial opening (Pl. IX. fig. 10 *b*). These "cells" have an average length of 0·04 mm. and a width of 0·017 mm.; they are filled with clear, secondary calcite, and consequently appear in section as lucid spots. As a general rule there appears to be one on each side of every mature zoœcium. Each of these acanthopore-like cells is situated close to the outer edge of the peristome, and rather more than half-way towards the frontal end of the aperture.

Horizon.—Ordovician; limestones exposed at mean sea-level, Akpatok Island. For associated fauna and correlation of the bed, see under *Ceramoporella* cf. *ohioensis* (p. 207).

Remarks.—This bryozoan belongs to the section of *Pachydictya* best exemplified by *P. elegans* Ulrich, in which the zoarium consists of narrow, parallel-sided branches, and in which the longitudinal arrangement of the zoœcia predominates. Its nearest affinities seem to be with *P. crassa* Hall, a species which ranges from the Uppermost Ordovician (Ellis Bay formation, Anticosti Island) through the Lower and Middle Silurian (Bassler, 1915, p. 929; 1928, pp. 87, 167). It differs from *P. crassa* in having zoœcial apertures which are smaller, narrower and relatively more widely separated in the longitudinal rows; it differs, apparently, from all previously described species of *Pachydictya* in the possession of acanthopore-like "cells." The almost constant association of a pair of these cells with each zoœcium suggests that they had some protective or feeding function. In their position relative to the zoœcial opening they are strikingly similar to the avicularia found in many of the Cheilostomatous Bryozoa. This comparison is perhaps not without significance in view of the suggested relationship between the Cryptostomata and the Cheilostomata (Bassler, 1911, p. 112).

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EXPLANATION OF THE PLATES.

PLATE VII.

Fig. 1. *Ceramoporella* cf. *ohioensis* (Nicholson). Vertical section. × 14. From Ordovician limestones at sea-level, Akpatok Island. Sedgwick Museum, A 14902 *a*.

Fig. 2. Ditto. Transverse section of same zoarium. × 16. Sedgwick Museum, A 14902 *b*.

Fig. 3. *Spatiopora* cf. *lineata* var. *incepta* Ulrich. Tangential section. × 17. From Ordovician limestones at 400 ft. above mean sea-level, Akpatok Island. Sedgwick Museum, A 6761 *b*.

Fig. 4. *Eridotrypa* sp. Longitudinal section of zoarial branch. × 31. From Ordovician limestones at sea-level. Akpatok Island. Sedgwick Museum, A 14903 *a*.

Fig. 5. Ditto. Transverse section of zoarial branch. × 44. Horizon as under fig. 4. Sedgwick Museum, A 14903 *b*.

PLATE VIII.

Fig. 6. *Diplotrypa petropolitana* (Pander, interp. Nich.) var. *ungava*, nov. Transverse section of holotype. × 13. From Ordovician limestones at sea-level, Akpatok Island. Sedgwick Museum, A 6760 *b*.

Fig. 7. *Diplotrypa petropolitana* (Pander) var. *ungava*, nov. Vertical section of holotype. × 12. Sedgwick Museum, A 6760 *f*.

PLATE IX.

Fig. 8. *Diplotrypa petropolitana* (Pander) var. *ungava*, nov. Transverse section of holotype showing characteristic point-contacts of zoœcial tubes. × 38. Sedgwick Museum, A 6760 *d*.

Fig. 9. *Pachydictya coxi*, sp. n. Holotype: transverse section through mature part of zoarium, showing mesial lamina and tubules. × 100. From Ordovician limestones at sea-level, Akpatok Island. Sedgwick Museum, A 6759 *e*.

Fig. 10 *a*. Ditto. Holotype: tangential section of zoarial branch. × 20. Sedgwick Museum, A 6759 *b*.

Fig. 10 *b*. Ditto. Drawing of zoœcial aperture as seen in tangential section, showing the associated pair of acanthopore-like cells.

Fig. 11. Ditto. Paratype: transverse section of immature branch of zoarium. × 44. Locality and horizon as for holotype. Sedgwick Museum, A 6759 *c*.

Fig. 12. Ditto. Paratype: transverse section of more mature part of zoarial branch, showing sheaths of ribbon-like lamellæ traversing the interzoœcial tissue. × 38. Locality and horizon as for holotype. Sedgwick Museum, A 6759 *f*.

XXIII.—*Results of the Oxford University Expedition to Sarawak (Borneo),* 1932. Acridiidæ (*Orthoptera*). By C. WILLEMSE, Eygelshoven, Holland.

WITH but three exceptions (indicated by the use of square brackets) all the Acridiidae recorded in this paper were collected by the Oxford University Expedition in which Dr. B. M. Hobby and Mr. A. W. Moore participated as entomologists. A general account of the expedition with a map of the area visited was published by T. H. Harrison, 1933, Geogr. J. vol. lxxxii. pp. 385–410; some of the ecological and botanical results are described by P. W. Richards, 1936, J. Ecol. xxiv. pp. 1–37, 340–360. The chief collecting stations were as follows:—

Mt. Dulit.—(*a*) Secondary forest in the vicinity of the base camp at the foot of the range, *i. e.*, on its north-eastern side where the River Tinjar receives the R. Lejok on its left bank (altitude less than 325 feet).

(*b*) Primary "Mixed forest" along the trail leading from the base camp to the high camp.

(*c*) Primary "Moss forest" around the high camp at 4000 feet.

(*d*) Primary "Heath forest" around the Koyan camp at 2500 feet on the south-western side of the range.

R. Kapah.—Primary "Mixed forest" near the R. Kapah, a right-bank tributary of the Tinjar about half a mile below the Lejok (altitude little more than that of base camp).

A few specimens were also taken in the "Heath forest" (white sand forest) at Claudetown (also known as Marudi or Baram) at an altitude of less than 160 ft. and on Mt. Kalulong, respectively about 60 miles to the north and 30 miles to the west of the base camp.

Most of the collection is preserved in the British Museum (Nat. Hist.); selected specimens are in the Oxford University Museum, Sarawak Museum, and my own collection; a single *Coloracris cœrulescens*, sp. n., is in the Stockholm Museum.

In the following lists reference to the year of capture is omitted, as all the specimens, except the three mentioned above, were taken in 1932.

Subfamily *EUMASTACINÆ.*

Chorotypus gallinaceus Fabr.

Mt. Kalulong, primary forest, 1800 ft., 2. xi., 1♀ (defective).

Erucius vitreus West.

This species was unknown from Borneo A careful comparison with the description and the related species *apicalis* West. makes the identification certain.

Foot of Mt. Dulit, trap baited with fish, flood refuse of cut reeds, on leaves in undergrowth, 28. viii.–10. ix., 5♂♂. R. Kapah, primary forest, from fungus, 24. ix.–7. x., 2♂♂.

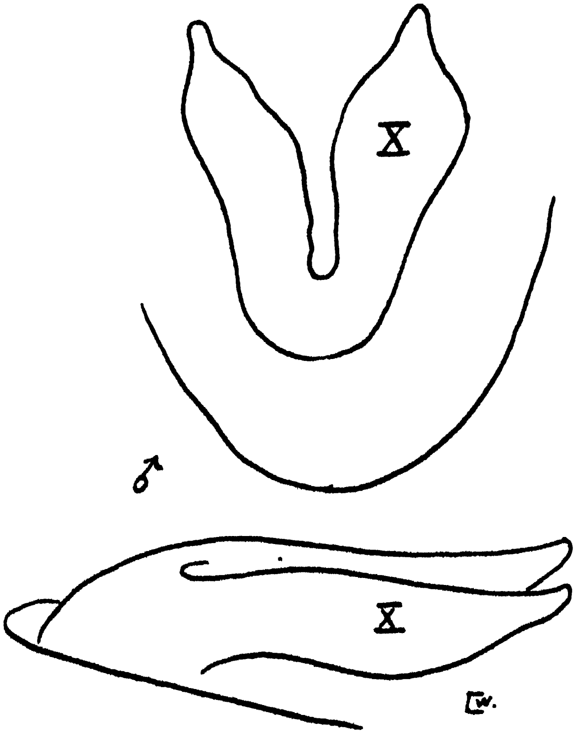
Erucius dusmeti Bol. C.

Mt. Dulit, moss forest, 4000–4500 ft., 14–29. x., 6♂♂ (one at light). Mt. Dulit, R. Koyan, primary forest, 2500 ft., 17. xi., 4♂♂.

Erucius moultoni Bol. C.

I am not sure of the determination, as I have no material for comparison. The elytra bears two dark transverse bands instead of one. The subgenital plate is not always of the same shape, sometimes being distorted by too rapid preservation. (Figs. 1–3.)

Fig. 1.



Erucius moultoni Bol. C., ♂.
Tergite X, seen from above and from aside.

Foot of Mt. Dulit, on shingle of river bed, 22. viii., 1 ♂. Dulit trail, primary forest, 16. viii., 1 ♂. R. Kapah, primary forest, from fungus, 24. ix., 4 ♂♂.

Fig. 2.

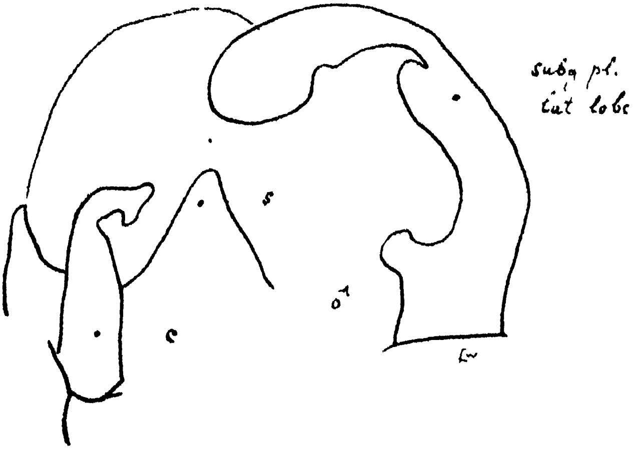
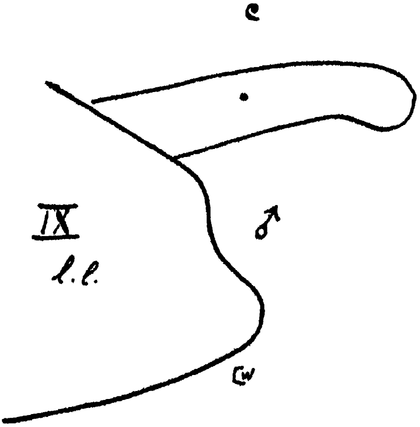


Fig. 3.



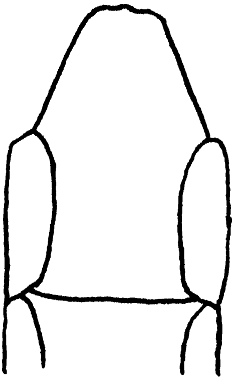
Erucius moultoni Bol. C., ? ♂.

Fig. 2.—Supra-anal plate and cercus, from above.
Fig. 3.—Lateral lobe of tergite IX. and cercus, seen from aside.

Eupatrides excelsus Brunn. v. Wattenw.

Foot of Mt. Dulit, near base camp, viii., 1 ♀. Fig. 4 illustrates the previously unfigured subgenital plate of the female.

Fig. 4



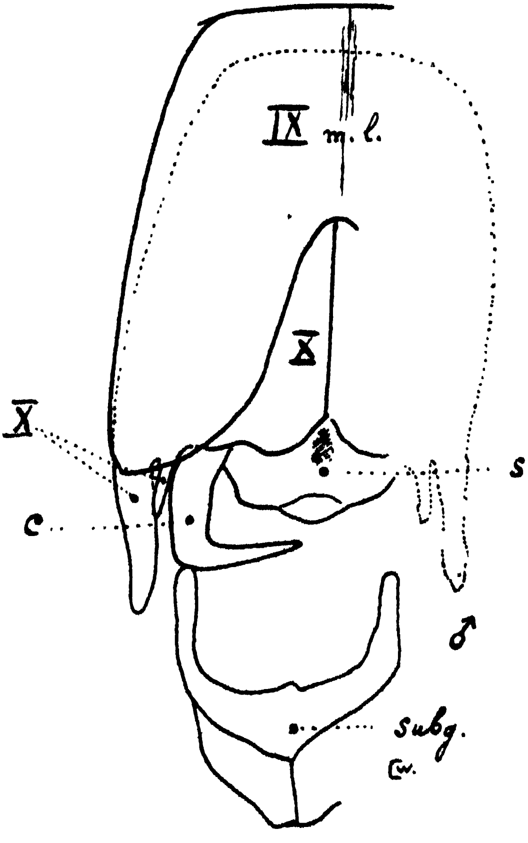
Eupatrides excelsus Br. v. W.
♀ subgenital plate.

Mnesicles poultoni Bol. C.

♂. Vertex with a faintly indicated median keel, rugosely sculptured on each side and on the cheeks. Fastigium of vertex horizontally produced in front of the eyes, about twice as long as broad, margins distinct and parallel, apex rounded. Frontal ridge with the margins distinct and thickened, distinctly widened above the median ocellus, below the median ocellus X-shaped, reaching the clypeal margin. Lateral facial keels distinct and thickened, slightly narrowed in the upper part, lower part straight and parallel. First antennal joint normal. Pronotum cylindrical, with the anterior margin truncate, posterior margin slightly rounded; median keel distinct near the anterior margin and in the metazona. Elytra reaching the apical fourth of hind femora, with fairly dense reticulation, anterior area slightly dilated near the base, anterior and posterior margin nearly parallel, apex rounded. Wings subcycloid. Anterior and median femora somewhat thickened, anterior femora with the lower outer margin smooth. Hind femora with the upper keel and upper outer keel distinctly dentate, with regular sharp teeth ; the other keels and lower keels indistinctly dentate, only with some small sparse and blunt teeth. Hind tibiæ with 23 outer and 15 inner spines. Outer apical spines small, equal in length. Posterior metatarsus with a longitudinal sulcus from above, inner margin finely serrate, outer margin nearly smooth with a row of 3 small teeth at the apex, continuing towards the pulvillus. Abdomen with the penultimate segments expanded, tergites with a fine longitudinal median keel ; 8th tergite normal, posterior margin truncate ; 9th tergite with a very large median lobe and a free smaller lateral lobe. The median lobe is somewhat tectiform in shape, covering a great part of the tenth tergite, its posterior margin deeply and roundly excised ; forming a rounded lobe on each side, lower margin straight. Lateral lobe smaller, somewhat longer than broad, its apex rounded triangular. The tenth tergite for the most part covered by the ninth tergite, its posterior margin slightly excised in the middle ; the tergite is on each side continued into two processes, the upper one being very small and closed round the insertion of the cercus, the lower one larger, both partly concealed by the median lobe of the ninth tergite and only visible at the posterior margin of the ninth tergite. Supra-anal plate triangular, apex rounded, in the specimen examined it is turned upwards. Cercus cylindrical in its basal half, slightly curved, near the middle sharply bent inwards at an angle of about 90°, apical half strongly attenuated, apex more or less sharply pointed. Subgenital plate curved upwards, apex triangularly excised on both sides, near the apex with a small median keel on its lower surface, the very apex rounded with a very small excision in the middle.

General coloration yellowish brown. Head brown with a pattern of small symmetrical reddish-brown spots along the frontal ridge, lateral keels, and on the cheeks. Eyes brown. Antennæ black with the basal joint reddish brown. Pronotum reddish brown, with irregular brown spots, especially on the lateral lobes, median keel in the metazona black, near the middle of anterior margin with a black spot. Epimerum of meso- and metathorax reddish brown, with blackish-brown spots. Elytra brown, with a hyaline spot near the apex and hyaline along the anterior margin. Wings hyaline, Anterior and median legs yellowish brown, tibiæ near the apex and tarsi darker-coloured. Hind femora yellowish brown, with a regular row of black stripes or spots along the outer and inner keels; knee brown. Hind tibiæ yellowish brown, darker apically, spines black. Hind tarsi yellowish brown. Abdomen yellowish brown, with a row of black spots from above and a row of small black stripes on each side. Median lobe of the ninth tergite in the male yellow. (Figs. 5, 6.)

Fig. 5.



Mnesicles poultoni Bol. C., ♂.

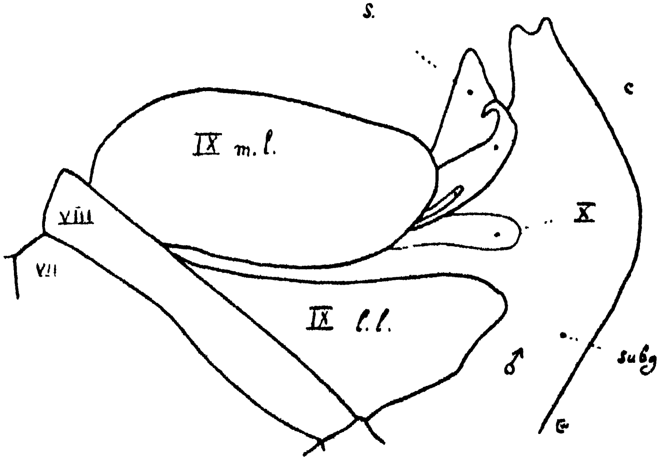
Apex of abdomen seen from above. IX *m.l.*, median lobe of tergite 9; X, tergite 10; *c*, cercus; *s*, supra-anal plate; *subg.*, subgenital plate.

♂. Length of body 19 mm., of pronotum 2·5 mm., of elytra 13 mm., of hind femora 13 mm.

Foot of Mt. Dulit, in house, 5. x., 1 ♀. Mt. Dulit, moss forest (in high camp house), 4000 ft., 15. x., 1 ♂.

This species was described by Bolivar (1931, Bol. Soc. Esp. Hist. nat. xxxi. pp. 292, 299, fig. 10) after a female. The male was unknown and Bolivar supposed he had an aberrant species before him. The discovery of the male makes it clear that it is really an aberrant form, probably a new genus. The large development of the median lobe of the ninth tergite, covering the largest part of the tenth tergite, makes it very different from all other known species. It is best not to establish a new genus until more material is available for comparison with other species of the genus.

Fig. 6.



Mnesicles poultoni Bol. ♂.

IX *m.l.*, median lobe of ninth tergite; IX l.l., lateral lobe of ninth tergite; X, processus of hind margin of tenth tergite; *c*, cercus; *s*, supra-anal plate.

Subfamily Acridinæ.

Aiolopus tamulus Fabr.

Claudetown, primary white sand forest, wide sunny path, 26. vii., 1 ♂.

Phlæobia antennata Brunn. v. Wattenw.

Foot of Mt. Dulit, viii.–22. ix., 3 ♂♂, 2 ♀♀; previously cultivated land, 9–28. viii., 7 ♂♂, 4 ♀♀; old secondary forest, 12. viii., 1 ♂; recent clearing, old secondary forest, 14. viii., 1 ♀. Mt. Dulit, moss forest, 4000 ft., 27. x., 1 ♀, beating. Long Lobang, in shade on wet undergrowth (Jalutong plantation), 28. x., 2 ♂♂, 2 ♀♀. Claudetown, primary white sand forest, wide sunny path, 26. vii., 1 ♂.

Subfamily *ŒDIPODINÆ*.

Trilophidia annulata Thunb.

Foot of Mt. Dulit, old secondary forest, recent clearing and previously cultivated land, 3. viii.–5. ix., 7 ♂♂, 4 ♀♀. Mt. Dulit, moss forest, 4000 ft., at light, 3. x., 1 ♀. R. Kapah, 5. x., 1 ♀. Claudetown, primary white sand forest, wide sunny path, 26. vii., 2 ♂♂, 3 ♀♀.

Subfamily *PYRGOMORPHINÆ*.

Atractomorpha psittacina de Haan.

Foot of Mt. Dulit, previously cultivated land and old secondary forest, 26. viii.–5. ix., 5 ♂♂, 2 ♀♀. Mt. Dulit, moss forest, 4000 ft., 19. x., 1 ♂, beating. R. Kapah, clearing, 5–7. x., 1 ♂, 2 ♀♀. R. Tinjar between base camp and Rumah Bulan Ding, riverside, 4–12. xi., 1 ♀. Mt. Kalulong, Long Manian, near house by riverside, 8. xi., 1 ♂.

Systella obliqua Walk.

Mt. Dulit, R. Koyan, primary forest, 2500 ft., 16. xi., 1 ♂.

Trigonopteryx hopei Westw.

Foot of Mt. Dulit, old secondary forest, in undergrowth on leaves, 17. ix., 1 ♀. Mt. Dulit, moss forest, 4000 ft., 22. x., 1 ♂. R. Kapah, primary forest, undergrowth, 23–24. ix., 2 ♂♂.

Subfamily *CATANTOPINÆ*.

Gesonia punctifrons Stål.

Foot of Mt. Dulit, previously cultivated land, 18. viii., 1 ♀.

Oxya chinensis Thunb.

Foot of Mt. Dulit, 7–28. viii., 4 ♀♀.

Traulia hosei Will.

Foot of Mt. Dulit, old secondary and primary forest, undergrowth, 9–10. x., 2 ♀♀. Mt. Dulit, primary forest, 3000 ft., 24. x., 1 ♂; moss forest, clearing, 4000 ft., 27. x., 1 ♂. The male was unknown. The measurements are as follows:—

Length of body 23 mm., of pronotum 5·5 mm., of elytra 15 mm., of hind femora 13 mm.

Traulia azureipennis Serv.

Foot of Mt. Dulit, previously cultivated land, 19–28. viii., 12 ♂♂, 3 ♀♀; recent clearing in old secondary forest, 14. viii.–2. x., 6 ♂♂, 4 ♀♀; light trap, 23. viii.–26. ix., 2 ♀♀; in reed-bed, 3. viii., 1 ♀. Long Lobang, on wet undergrowth, Jalutong plantation, 28. x., 1 ♂. Claudetown, medium shady path, rubber garden, 27. vii., 3 ♂♂, 1 ♀.

Catantops splendens Thunb.

Foot of Mt. Dulit, 13. viii.–3. ix., 1 ♂, 4 ♀♀; recent clearing, old secondary forest, 14. viii., 2 ♂♂; burning padi-clearing, 13. ix., 1 ♂, 4 ♀♀; previously cultivated land, 22–26. viii., 1 ♂, 1 ♀; light trap, 26. viii., 1 ♀; at light in house, 4. viii., 1 ♀.

Catantops humilis Serv.

Foot of Mt. Dulit, 19. viii.–3. ix., 4 ♂♂, 2 ♀♀; previously cultivated land, 19–28. viii., 6 ♂♂, 4 ♀♀; burning padi-clearing, 13. ix., 1 ♀, 2 ♂♂; light, 3. x., 1 ♀; light trap 5, 26. ix., 1 ♂; recent clearing in old secondary forest, 29. viii., 1 ♂.

Patanga succincta Linn.

Foot of Mt. Dulit, 28. viii., 1 ♂.

Patanga luteicornis Serv.

Foot of Mt. Dulit, 9. viii., 1 ♂.

COLORACRIS, gen. nov.

Size medium, body robust, rugosely punctate. Antennæ filiform, reaching far behind the posterior margin of pronotum. Head thick, face slightly reclinate; frontal

ridge only indicated between the antennæ and projected there. Face, like the rest of the head, rugosely punctured. Lateral facial keels only indicated near the eye, subobliterate, slightly curved. Fastigium of vertex sloping, hexagonal, margins obtuse, forming with the frontal ridge a rounded angle, narrowed between the eyes. Occiput convex without median carinula. Eyes strongly prominent sideways, globose, interocular distance in the female as broad as the first antennal joint, in the male somewhat shorter. Pronotum cylindrical, anterior margin slightly rounded, posterior margin broadly rounded; median keel indistinct or absent, lateral keels absent, submarginal sulcus only distinct on the lateral lobes, first transverse sulcus only distinct on the disc, second and third transverse sulcus distinct both on the disc and on the lobes, third transverse sulcus far behind the middle. Lateral lobes about as long as high, lower margin ascendant from its middle to the anterior margin, likewise to the posterior margin but in less degree, anterior and posterior angle rounded; posterior margin nearly straight or slightly convex. Prosternal tubercle short, conical, sharply pointed. Mesosternal lobes broader than long, their inner margin convex, their interspace broader than long; metasternal lobes separated, especially in the female. Elytra and wings reaching the top of abdomen. Elytra with dense reticulation, anterior and posterior margin nearly parallel, slightly narrowing towards the apex, apex rounded. Wings subcycloid. Hind femora short, rather thick, carinæ subserrate, nearly smooth; knee-lobes rounded. Hind tibiæ slightly curved, not expanded apically, with 9 inner and 6 outer spines, without outer apical spine. Hind tarsi short, not extending beyond the middle of hind tibia; second joint much shorter than the first one, third joint about as long as the two others together.

♂. Supra-anal plate triangular, apex rounded, with a triangular basal impression and an impression on each side of its surface. Cerci reaching a little beyond the supra-anal plate, nearly straight, slightly dilated towards the apex, near the apex with a tooth on the inner side, apex obtuse. Subgenital plate short, obtuse.

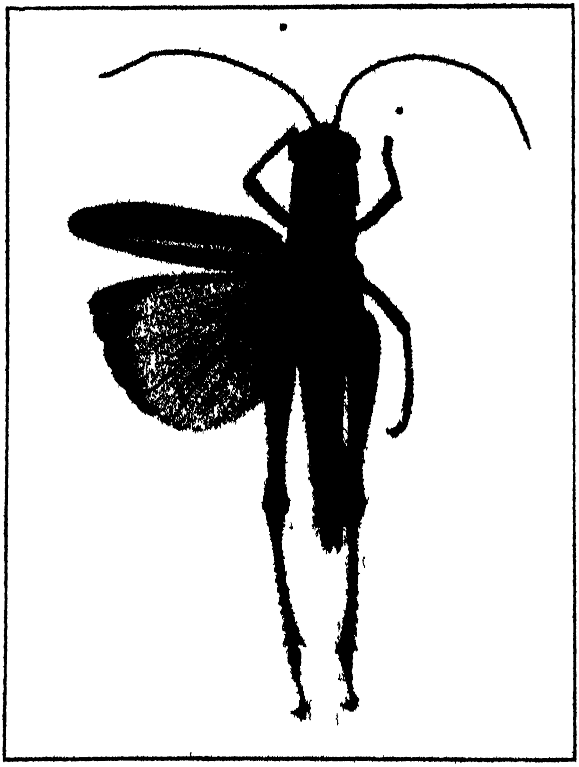
♀. Supra-anal plate triangular, apex obtuse. Cerci short, conical, not reaching beyond the supra-anal plate, apex obtuse. Valves of ovipositor short, apex hooked, margin obtuse. Subgenital plate longer than broad, posterior margin obtuse angulate.

Genotype : *Coloracris cœrulescens*, sp. n.

Coloracris cœrulescens, sp. n.

♂♀. General coloration black with yellow. Antennæ black, basal joints yellowish brown, apical joint yellowish. Head black, fastigium of vertex yellow, occiput with two narrow longitudinal yellow stripes, continuing on the sides of the pronotum and terminating in the longitudinal yellow stripe in the middle of the elytra. Face black, with a yellow spot below the frontal ridge

Fig. 7.



Coloracris cœrulescens, sp. n., ♀, type.

and a yellow spot on each side near the clypeal margin. A yellow longitudinal stripe runs from the base of antennæ along the lower margin of the eye, across the cheek, crossing the middle of lateral lobes of pronotum, and terminating on the epimerum of meso- and metathorax. Labrum with a yellow spot on each side, mandibles with two yellow spots. Palpi yellow. Pronotum black with a narrow longitudinal yellow stripe on each side of the disc; lateral lobes with a narrow transverse yellow stripe in the middle. Elytra brownish black, with a longitudinal yellow stripe in the middle along the anal vein. Wings bluish, with the apex infumated and a small blackish stripe bordering the posterior margin, reaching backwards only to the middle of the posterior margin. Anterior and median legs olivaceous-green, coxæ with insertion black with yellow spots, tarsi brown, with a yellowish-brown stripe from above. Hind femora coral-red, area infero interna dirty yellow; knee black, with an indication of a lighter-coloured red prægenicular ring. Hind tibiæ and tarsi blackish brown, spines black. Epimerum of pro-, meso-, and metathorax yellow. Sternum black with symmetrical yellow spots. Abdomen black, sternites with a row of yellow spots in the middle, margins of tergites bordered with yellow, from above with a yellow stripe in the middle or on each side Valves of ovipositor yellowish brown. (Fig. 7.)

	♂.	♀.
Length of body	23 mm.	26 mm.
„ pronotum ..	5	6
„ elytra	15	18·5
„ hind femora.	13	17

[Baram River, Leppu Aga, 1 ♀ (type), 1 ♂ (coll. mea); Sarawak distr., E. Mjöberg, 1 ♀ (coll. Mus. Stockholm)]; Mt. Dulit, primary forest, 2500 ft., 6. x., 1 ♀*.

Coloracris azureus, sp. n.

♀. General coloration reddish brown with yellow. Antennæ black, basal joints olivaceous-green, apical joints yellowish white. Head olivaceous-green, apex of fastigium of vertex olivaceous-green, posterior part yellow; occiput dark olivaceous-green with two longitudinal yellow stripes beginning on the fastigium of vertex, continuing on the sides of the occiput, along the sides of the disc of pronotum, and terminating in the longitudinal yellow stripe in the middle of the elytra. Face olivaceous-green with indistinct yellow spots. A yellow longitudinal stripe running from the base of antennæ along the lower margin of the eye, across the cheek, crossing the lower part of the lateral lobe of pronotum, and terminating in the posterior margin of lateral lobes.

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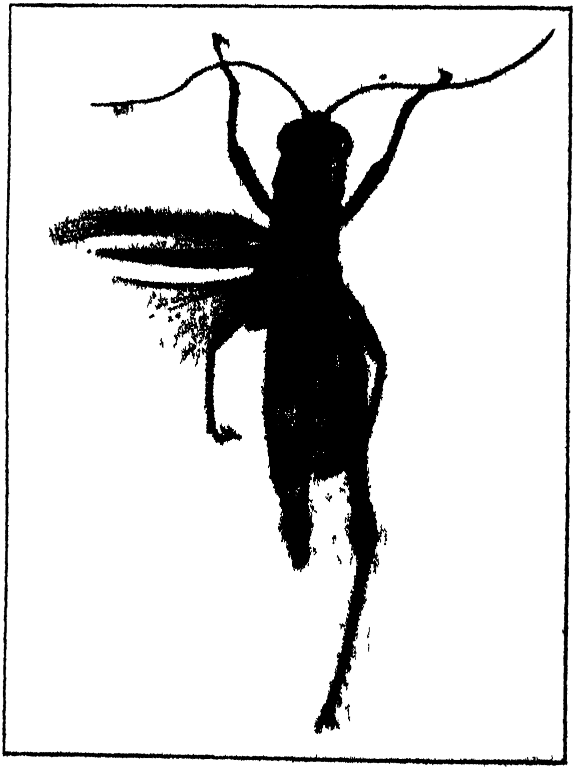
* This female does not agree in all features with the type. The anterior and median legs are more yellowish red, the hind femora, instead of coral-red, are yellowish red also. For all other features there is no difference.

Fig. 8



Coloracris azureus, sp. n., ♀, type.

Clypeus, labrum, and mandible olivaceous-green with some irregular yellow spots. Palpi brownish black. Pronotum dark carmine-red in the middle of the disc, bordered by the yellow longitudinal stripes on each side; lateral lobes carmine-red with a yellow longitudinal stripe in the lower part. Elytra reaching the apex of hind femora, bluish with a yellowish stripe along the anal vein from base to apex. Wings azureous blue, without black along the posterior margin. Anterior and median legs olivaceous-green, coxæ more yellowish brown. Hind femora dark carmine-red, arc. genic. sup. somewhat blackish. Hind tibiæ bluish, spines with black tips. Epimerum of meso- and metathorax carmine-red. Sternum yellowish brown, partly bordered with carmine-red. Abdomen yellowish brown, with a longitudinal dark stripe from above and on the sides. Valves of ovipositor brown. (Fig. 8.)

♀. Length of body 28 mm., of pronotum 5·5 mm., of elytra 17 mm., of hind femora 17 mm.

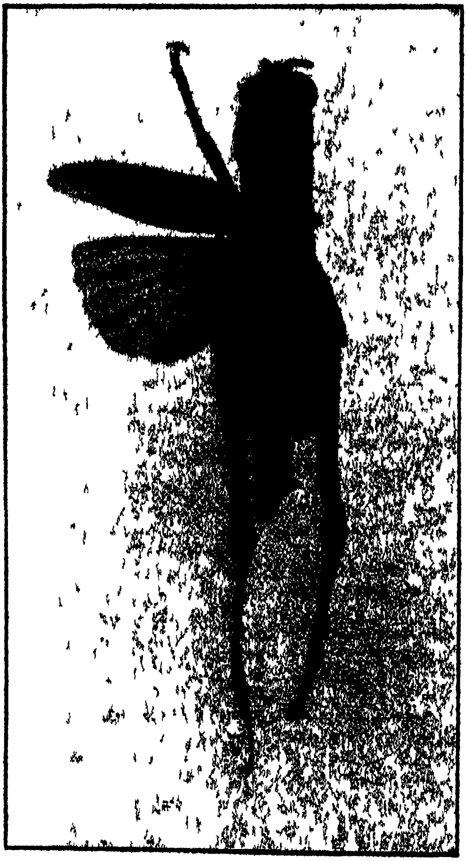
♂. Unknown.

Mt. Dulit, R. Koyon, primary forest, 2500 ft., beating, 20. xi., 1 ♀ (type).

Coloracris viridis, sp. n.

♀. General coloration olivaceous-green. Antennæ missing, except basal joints which are black. Head olivaceous-green, fastigium of vertex yellow; occiput with two narrow longitudinal yellow stripes on each side, beginning behind the eyes and continuing on the sides of the disc of pronotum, terminating in the longitudinal stripe in the middle of elytra. Face dark olivaceous-green, with a yellow spot below the frontal ridge and a yellow spot on each side near the clypeal margin. A yellow longitudinal stripe running from the base of antennæ, along the lower margin of the eye, across the cheek, crossing the lower part of lateral lobes of pronotum and terminating on the epimerum of meso- and metathorax. Labrum with three yellow spots, mandibles with two yellow spots. Palpi yellowish. Pronotum dark olivaceous-green, with a yellow longitudinal stripe on each side of the disc, lateral lobes with a yellow transverse stripe in the lower part. Elytra relatively short, only extending a little beyond the middle of hind femora, olivaceous-green or brown, with a longitudinal yellow stripe along the anal vein. Wings pale bluish without black along the posterior margin; with a yellowish stripe along the radial vein. Anterior and median legs olivaceous-green, coxæ yellowish brown. Hind femora olivaceous-green, inner area more yellowish, knee reddish brown. Hind tibiæ bluish green, spines with black tips. Hind tarsi reddish brown, first joint

Fig 9



Coloracris viridis, sp. n., ♀, type.

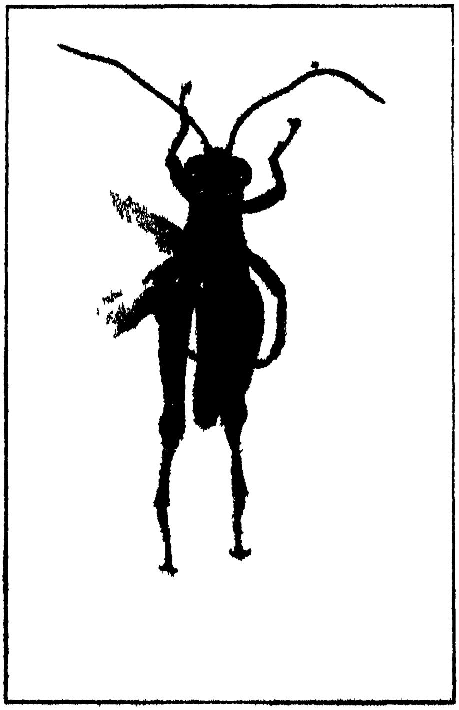
with a black stripe from above. Sternum and abdomen yellowish brown, sides of abdomen brown with a longitudinal yellowish stripe on each side from above. Valves of ovipositor brown. (Fig. 9.)

♀. Length of body 29 mm., of pronotum 6 mm., of elytra 14·5 mm., of hind femora 17 mm.

♂. Unknown.

Mt. Dulit, moss forest, 4000 ft., 22. x., 1 ♀ (type).

Fig. 10.



Phalaca sarawakensis, sp. n., ♂, type.

Phalaca sarawakensis, sp. n.

♂. General coloration yellowish brown. Antennæ black, basal and apical joints yellowish brown. Head yellowish, clypeal margin brownish, fastigium of vertex and occiput with a dark brown stripe in the middle, continuing on the middle of the disc of pronotum. Postocular fasciæ brown or blackish brown. Pronotum yellowish brown, disc with a median brown longitudinal stripe, lateral lobes with a transverse brown stripe in the upper part, both reaching from the anterior to the posterior margin; lower margin of lateral lobe brown in the middle. Elytra reaching the top of abdomen, uniform yellowish brown, relatively narrow, apex broadly rounded. Wings subhyaline. Episternum of meso- and metathorax yellow. Anterior and median legs yellowish brown. Hind femora yellowish brown; hind knee brown, arcus genicularis black. Hind tibiæ yellowish brown, somewhat darker apically, spines with black tips. Hind tarsi yellowish brown, first and second segment black from above. (Fig. 10.)

♂. Length of body 21 mm., of pronotum 5·5 mm., of elytra 12·5 mm., of hind femora 12 mm.

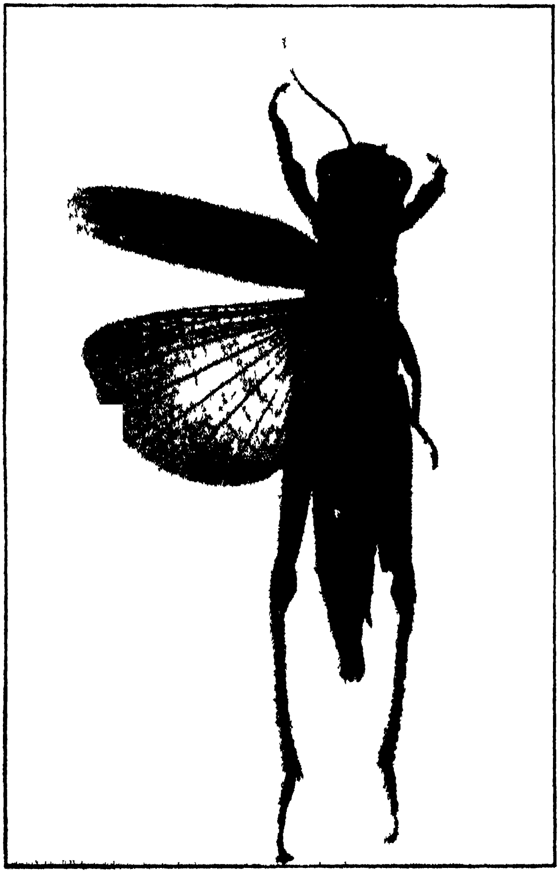
♀. Unknown.

Mt. Dulit, moss forest, 4000 ft., beating, 27. x., 1 ♂ (type). Foot of Mt. Dulit, previously cultivated land, 19 & 26. viii., 2 ♂♂; recent clearing in old secondary forest, 29. viii., 1 ♀.

Pareuthymia obscura, sp. n.

♀. General coloration blackish brown. Antennæ blackish brown, basal joint brown. Head and pronotum rugosely punctured, except the middle of occiput and sides of vertex which are nearly smooth. Head blackish brown with more or less regular blackish spots. Pronotum with a rounded incision in the middle of anterior margin, posterior margin rounded angulate, sulci distinct, both on the disc and on the lobes, except the anterior sulcus that is only indicated on the disc, third sulcus behind the middle; lateral lobes about as long as broad, lower margin slightly concave in the anterior half, anterior angle acute, posterior angle angulately rounded. Pronotum brown with irregular blackish spots and rows of points, both on the disc and on the lobes. Elytra relatively broad, apex rounded, brown with 3–4 irregular transverse bands of blackish-brown colour especially in the apical half. Wings subcycloid, greenish brown, apex and posterior margin very broadly infumated. Insertion of the coxæ brown. Anterior and median legs brown, variegated with blackish-brown spots. Hind femora yellowish brown, outer area with two blackish brown transverse bands, lower and inner area yellowish brown,

Fig. 11



Pareuthymia obscura, sp. n., ♀, type.

with longitudinal blackish stripes, knee blackish brown. Hind tibiæ yellowish brown, from below and near the apex blackish, spines with black tips. Hind tarsi yellowish brown, first and second segment blackish from above Sternum and abdomen blackish brown. Supra-anal plate long, triangular, with a median longitudinal sulcus from base to apex. Cerci short, straight, conical, more or less pointed. Valves of ovipositor long and slender, margins smooth, apex slightly hooked, upper valves somewhat broader than the lower ones. Subgenital plate somewhat longer than broad, posterior margin triangularly excised on both sides and with a large triangular projection in the middle. (Fig. 11.)

♀. Length of body 39 mm., of pronotum 7 mm., of elytra 23 mm., of hind femora 19 mm.

♂. Unknown.

Mt. Dulit, moss forest, 4000 ft., 28. x., 1 ♀ (type).

XXIV.—*Sawflies of the Family* Tenthredinidæ *in Australia, with the Description of a new Genus and Species* (*Hymenoptera, Symphyta*). By Robert B. Benson, M.A., Department of Entomology, British Museum (Natural History).

Except for the introduced *Caliroa limacina* Retzius only one representative of the family Tenthredinidæ has up till now been found in Australia—*Senoclidia furva* (Konow) (1898), of which a single specimen was taken at Port Darwin in North Australia (Benson, 1935). This species was described from Papua, and has affinities with the Malayan fauna. It is all the more interesting therefore that among specimens sent to me for naming from New South Wales, through the Imperial Institute of Entomology, were representatives of a new genus of the Tenthredinidæ more closely related to certain South American genera than to any others known. Further specimens of the same species were found later in collections sent for naming from the Museum at Canberra

(Dr. A. L. Tonnoir) and the Australian Museum at Sydney (Dr. C. Anderson).

CHEILOPHLEPS gen. nov. (Blennocampinæ).

♂♀. *Head* with eyes converging towards the front so that in front the eyes are closer together than the length of an eye; mouth-parts normal, maxillary palp being about as long as the front basitarsus and following tarsal segments together; clypeus with the front margin excised; malar space linear; antenna 9-segmented, about 1½ times as long as the breadth of the head; simple and without sensory pits under the apical segments.

Thorax with cervical sclerites not meeting in front; prepectus absent; cenchri overlapping their bases and slightly narrower than the distance between them.

Wings as in *Lycaota* Konow except that the anal cell in the fore wing (fig. 2), instead of being constricted in the middle by the fusion of the anal and submedian veins, is only contracted here and crossed by a very short oblique vein as in some species of *Macrophya*; in the hind wings the radial cell is closely apically and reaches the apex of the wing; there is one closed discoidal cell in the ♀ and the stalk of the anal cell is scarcely longer than the breadth of the cell; in the ♂ the hind wing is margined by a continuous vein as far as the anal vein. *Legs* with tarsi of middle and front legs slightly longer than tibia; in hind legs tibia is slightly longer than the tarsi; claws with a large subbasal tooth almost as long as the end tooth and also with a large acute basal lobe. *Abdomen* rather slender; first tergum divided in the middle. *Puncturation* and *pubescence* sparse throughout.

Type: *Cheilophleps xantha*, sp. n.

This genus appears to be closely related to *Trichiotaxonus* Rohwer (1910) of Chile and *Synaptoneura* Konow (1908) of Bolivia, and belongs to the tribe Lycaotini of the Blennocampinæ, as defined in my forthcoming paper on the classification of the sawflies.

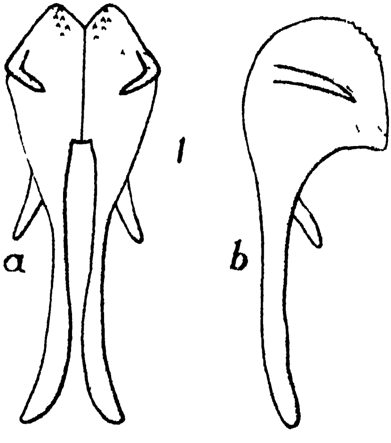
Trichiotaxonus Rohwer is distinguished at once by the long hairs on the head and thorax, and the claws with three parallel apical teeth, while in *Synaptoneura* Konow the radial cell of the hind wing is remote from the apex of the wing.

Cheilophleps xantha, sp. n.

♂♀. *Head* and *thorax* black, with the following parts yellowish white: labrum, mouth-parts, tegulæ, pronotum, hind and upper ⅓ of mesepisternum and mesepimerum, metapleura, legs (except apex of tibia and tarsi of front legs, and most of tibiæ and tarsi of middle and hind legs, which are suffused with brown); the coxæ and femora of the hind and middle legs are yellower than in the front legs.

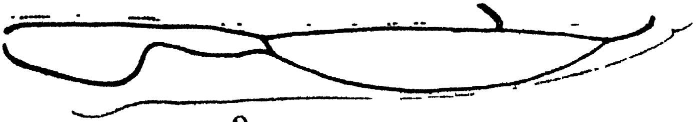
Abdomen yellow except for the apex from segment 8.

Wings slightly and evenly infuscate; stigma and venation black. *Length* 7·5 mm.; fore wing 7 mm.; antenna 3 mm. *Puncturation*: whole insect very shining; head with sparse scattered punctures, especially on clypeus and frons; thorax and abdomen unpunctured except for the front of the mesonotum. *Pubescence* short and pale all over except on the dorsal surface of the abdomen, which is glabrous.



Cheilophleps xantha, sp. n.
Penis valves, (*a*) from above, (*b*) from the side.

Head: antenna with segment 3 almost as long as segments 4+5; frontal area convex and slightly notched through the middle, so that the deep median fovea is not entirely cut off from the frontal furrow; POL=OOL; distance between the hind ocelli about equal to the distance of one of them from the hind margin of the head; postocellar area with very deep lateral pits. *Thorax* with hind basitarsus longer than three following tarsal segments together, and almost as long as all the following tarsal segments. *Abdomen* with ♂ genitalia as in figs. 1 *a* and *b*; ♀ saw-sheath long, projecting, and narrowed behind.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Cheilophleps xantha, sp. n.

Anal cell of the fore wing.

New South Wales: Bulga, 9 ♂♂, 22. ix. 1926 (*W. W. Froggatt*) (holotype and one paratype in British Museum; two paratypes in W. W. Froggatt's collection; five paratypes in Canberra Museum). East Dorrigo, 1 ♀, 3. xii 1924 (*W. Heron*) (allotype in the Sydney Museum).

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General Biology. A Text-book for College Students. By Professor P. D. Strausbaugh and Professor B. R. Weimar. London: Chapman and Hall Ltd., 1938. Pp. xi+555. Price 18*s*. 6*d*. net.

Even at this period of the teaching of natural science, there still exists a tendency, exemplified in some of our elementary examination papers, to regard biology as botany plus zoology. The volume under consideration represents a welcome attempt to depart from this unhealthy view, and to present biology as the science of life. The authors must be held to have succeeded in their efforts; they have made a dynamic picture of the organism as a living and working machine—using this last word in a very wide sense—and have discussed very fully the reactions between the organism and its environment.

Taxonomy has its share, and no more than its share, of the argument, and the student of the book, even though he may not have acquired a detailed knowledge of the structure and classification of the types so characteristic of the orthodox treatment, will possess an elementary knowledge of the main problems of the living kingdom—a knowledge on which he may build with the confidence that he will have little or nothing to unlearn.

The standard of the book is that of a first year college course, and it may be used with advantage by the higher forms in schools. But the book makes a wider appeal. The reader who is not specially trained in biological matters will find the volume an admirable introduction to the closer study of those problems of heredity and of eugenics which are at present arousing so much interest.

The author, quite rightly in a book of this scope, does not go into questions of experimental detail, and the book must not be considered as in any way a laboratory manual, though the student who reads it intelligently will realize something of the spirit of the experimental approach to these problems.

Five chapters on Metabolism are concerned with the manufacture, digestion, absorption, transport, and distribution of food, the release of energy, and the production and elimination of waste materials. Succeeding chapters deal with environmental relations, with growth and reproduction, with heredity and eugenics, with taxonomy, with representatives of the animal and plant kingdoms, with evolution, and with the relation of biology to other sciences.

The treatment is lively and exact, and abounds in interesting illustrations, many of which are, as is only natural, drawn from American practice. We in England, for example, may count ourselves fortunate in that we are not called on, in our agricultural work, to enlist the services of a hopperdozer. The illustrations are many, and are well chosen; some are in colour, and the line drawings make a vigorous appeal to the eye. Every chapter is followed by a selection of works for further reading. The price is moderate, and the book may be unreservedly commended, N. F.

THE

ANNALS AND MAGAZINE

OF

NATURAL HISTORY.

[ELEVENTH SERIES.]

No. 9. SEPTEMBER 1938.

XXV.—*New Caradocian Brachiopods from the Berwyn Hills, North Wales.* By H. B. WHITTINGTON, B.Sc., University of Birmingham.

[Plates X. & XI.]

THE fossils here described have been collected during mapping in the area around Llansantffraid-ym-Mechain, seven miles south-west of Oswestry, Shropshire, and from Glyn Ceiriog, Denbighshire. Work is still in progress, but certain fossils which have proved of great value as zonal indices within the Berwyn Hills outcrops (some have a much wider geographical range) appear to be worthy of description. The fossils are all preserved as casts, so that direct observation on shell structure has been impossible.

In mapping and collecting I have endeavoured to trace the zones proposed by Mr. B. B. Bancroft (1933) and to verify his correlations of North Welsh horizons with the Shropshire succession. I am grateful to Mr. Bancroft for the help he has given me in correspondence with him. I have provisionally referred two of the fossils dealt with in the present paper to the names *Wattsella indica* and *Raymondella typa*, which were published by Bancroft as referring to two of his index fossils. These latter were very briefly defined, with reference to their horizon, by Bancroft in an account of the stratigraphy of the Horderley Sandstone and Longville Flags (1928, pp. 33–40) as *W*. sp. C and *W*. sp. D, a locality being given for the former. In his Correlation Tables (1933) a summary of the succession in the Horderley Sandstone and Longville Flags is given by Bancroft, without any bibliographical reference to the publication of 1928. However, the two successions correspond exactly, and we find that *W*. sp. C has been named *W. indica*, and *W*. sp. D specified as *R. typa*, and made the genotype of *Raymondella* (1933, p. 3). If the International Rules of Nomenclature, Article 25 (*c*), are literally interpreted, it may be considered that these specific names are invalid, owing to the shortness of the summary of characters published in 1928, and the absence of any bibliographical reference to this summary in the 1933 publication. I consider the genus *Raymondella* to have been adequately defined, and have preferred to use Bancroft's specific names, as published in 1933, out of courtesy to Mr. Bancroft, since I think my material is conspecific with that labelled *W. indica* and *R. typa* in the Bancroft Collection in the British Museum (Natural History). The alternative courses are either to adopt new names or refer my fossils to *W*. sp. α and *R*. sp. α, and would, in my opinion, only result in greater confusion than at present exists. I understand from Mr. Bancroft that he is hoping to publish full descriptions of all his zone indices, but unfortunately this has already been delayed for over five years.

It is with pleasure that I thank Professor L. J. Wills, under whose guidance I am working in North Wales, and Dr. A. Lamont, with whom I have had many stimulating discussions on Upper Ordovician faunas. I am grateful, also, to Professor W. B. R. King for his interest in my work.

Superfamily **ORTHACEA** Walcott & Schuchert, 1908.

Genus ORTHIS Dalman 1828 (sensu stricto).

Orthis calligramma Dalman var. nov. *berwynensis*.

(Pl. X. figs. 1–3.)

Diagnosis.—Shell subcircular, slightly wider than long; valves about equally biconvex; maximum width at about half the length, cardinal angles rounded. Ventral valve with beak forming apex, and rising high above hinge-line, but not incurved; inter-area triangular, catacline; the delthyrium closed by the deltidium. Ventral interior with two short, strong dental plates diverging at 90°, continued forward for a short distance by low ridges, which are cut off by the furrowing. Muscle-area not defined.

Dorsal valve moderately convex; hinge area triangular, orthocline; beak projecting slightly behind hinge-line; cardinal process small, ovoid; crural plates short, thick, diverging at 70°; muscle-scars obscure.

Surface of shell ornamented by about 22 simple, strong ribs, having interspaces of approximately the same width as the ribs, and showing concentric growth-lines. Ribbing sharply reproduced in the interior of the shell.

Syntypes.—Nos. 295–297, Geological Department Museum, University of Birmingham.

Dimensions.—Length 18 mm.; width 21 mm.

Horizon.—*Heterorthis retrorsistria* and *Resserella cruralis* beds of the Middle Soudleyan.

Localities.—Quarry on the north side of road, one-third of a mile east of Pen-y-rhiw, 1½ miles north-west of Llanyblodwel, Shropshire. Old quarry behind Smithy, Bwlch-y-cibau, 2¼ miles south-east of Llanfyllin, Montgomeryshire.

Discussion.—This species is present in large numbers in beds of fine sandstones with mudstones. It is similar to *Orthis calligramma* var. *craigensis* Reed (1917, p. 827, pl. v. figs. 7–9), but appears to be rather smaller in size and to have fewer ribs. The ventral valve of the new variety has the same shape as the Craighead and Bougang varieties, but the inter-area is smaller and the muscle-scar obscure, in contrast to that of *O. calligramma* var. *craigensis*, described but not figured by Dr. Reed (1917, p. 828). The brachial valve of the Welsh variety is moderately convex and bears no trace of a median depression, as does *O. calligramma* var. *craigensis*.

The specimens from the "Caradoc, Moelydd, near Bala," figured by Davidson (1864, vol. iii, pl. xxxv. figs. 1–3) should probably be included in the new variety; but his figs. 12, 23, and 24 on the same plate, also from North Welsh localities, cannot be so included.

Superfamily DALMANELLACEA Schuchert & Cooper, 1931.

Genus DALMANELLA Hall & Clarke, 1892, emend. Öpik, 1933.

Subgenus WATTSELLA Bancroft, 1928.

Discussion.—The genus *Dalmanella* Hall & Clarke, 1892, was established by quoting and reproducing Dalman's figures of *Orthis testudinaria,* and figuring American species, including some identified as *O. testudinaria* (Hall & Clarke, 1892, pp. 205–207, pl. VB, figs. 25–39, pl. VC, figs. 1–47, also p. 192, footnote).

Schuchert and Cooper (1932, pp. 120–121) claimed *Dalmanella* Hall & Clarke as being founded on the American material that Hall and Clarke had before them, and not on Dalman's figures which they cited and reproduced. They wished to retain for the American dalmanellid group the generic name *Dalmanella*, and therefore selected some of Hall and Clarke's figures, which were of *Orthis rogata* Sardeson, and made it the genotype of *Dalmanella*. The European dalmanellid group was given the generic name *Wattsella* Bancroft, 1928, since "Bancroft's recently proposed *Wattsella* has a structure identical with that of *Orthis testudinaria* Dalman, and must therefore include that species" (Schuchert & Cooper, p. 125). Further, *Wattsella* is placed in the family Wattsellidæ Schuchert & Cooper, 1931 (p. 124), and *Dalmanella* in the family Dalmanellidæ Schuchert, 1929 emend. (1932, p. 119). In the synonymy of *Dalmanella* (emend.) is placed the genus *Onniella* Bancroft 1928.

A. Öpik (1933) has pointed out that Schuchert and Cooper were not obeying the rules of International Nomenclature in restricting *Dalmanella* Hall & Clarke to American dalmanellids. Since Hall and Clarke cited and reproduced Dalman's original figures of *O. testudinaria*, the genus *Dalmanella* is founded on European material, and not on American dalmanellids mistakenly identified as *O. testudinaria* by Hall and Clarke. Öpik has shown (1933, p. 15) that it follows from this that *Wattsella* Bancroft is replaced by *Dalmanella*, and the family Wattsellidæ Schuchert & Cooper, 1931, by Dalmanellidæ. The dalmanellid group with *Orthis rogata* Sardeson as its genotype (i. e., *Dalmanella* of Schuchert and Cooper) corresponds to *Onniella* Bancroft, 1928, which is consequently the correct generic name for it, and family Dalmanellidæ Schuchert, 1929, is replaced by family Onniellidæ Öpik, 1933.

This procedure results in the loss of the generic name *Wattsella*, which was proposed by Bancroft (1928, p. 55), having as its genotype *Wattsella wattsi* Bancroft. The group is well defined, the shells being characterized particularly by angular ribbing, often coarse, e. g., *Wattsella horderleyensis* Whittington [ex Bancroft] (see Whittington, 1938, pp. 50–51, pl. vi. figs. 2–7) and *Wattsella unguis* (J. de C. Sowerby) (see Davidson, 1864, p. 257, pl. xxxvii. figs. 16–22), and may be at least a subgenus of *Dalmanella* emend., if not of generic rank within the family Dalmanellidæ.

Although both Schuchert and Cooper (1932, pp. 125–126) and Öpik (1933, pp. 14–16) have satisfied themselves that *Dalmanella testudinaria* is congeneric with *Wattsella*, until our knowledge of European and American dalmanellids is extended, the retention of the name *Wattsella* Bancroft seems advisable.

Wattsella indica Bancroft, 1933.
(Pl. X. figs. 4–7.)

1929. *Wattsella* sp. C, Bancroft, B. B., Mem. Proc. Manchester Lit. & Phil. Soc. vol. lxxiii. p. 37.

1933. *Wattsella indica* Bancroft, B. B., Correlation Tables of the Stages Costonian-Onnian in England and Wales.' Privately printed.

I have collected dalmanellids from two localities in the Berwyn Hills which cannot be referred to any species hitherto described. The localities are :—

(*a*) Blue mudstones between ash and conglomerate, quarry at Bryn Farm, 1 mile south-east of Glyn Ceiriog, Denbighshire.

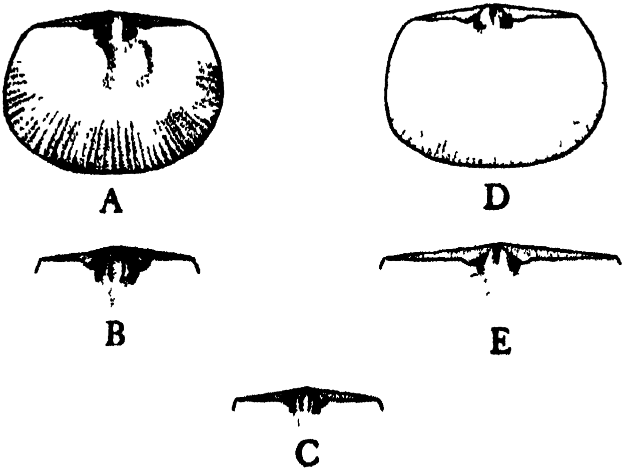
(*b*) Old quarry ¼ mile east of point 822 in Ancient Camp, Bryngwyn Hill, 3 miles east-south-east of Llanfyllin, Montgomeryshire.

The form may be described as follows :—

Diagnosis.—Shell subquadrangular in outline, slightly wider than long ; moderately biconvex ; maximum width at about one-third of the length ; cardinal angles rounded, obtuse. Ventral valve quite strongly convex, beak projecting behind hinge-line; inter-area triangular, apsacline. Ventral interior with short, strong dental plates diverging at 45°, continued directly forward by low ridges bounding the muscle area, which latter is bounded anteriorly by a curving emarginate ridge; or muscle-areas obscure.

Dorsal valve gently convex, with a shallow median sinus posteriorly; hinge-area triangular, anacline; cardinal process spear-shaped, with a circular head posteriorly, and continued forward as a parallel-sided broad plate; crural plates broad, running directly forward parallel to the cardinal process, with a small triangular fulcral plate laterally; muscle-scars indistinct oval areas flanking the median sinus (see text-fig. 1).

Text-fig. 1.



A. *Wattsella indica* Bancroft. Internal cast of dorsal valve, showing the cardinal process and the relative sizes of the crural and fulcral plates. Same as Pl. X. fig. 5. B. Ditto. Hinge-line of internal cast of dorsal valve, showing cardinalia. Same as Pl. X. fig. 4. C. Ditto. Same as Pl. X. fig. 6. D. *Raymondella typa* Bancroft Internal cast of dorsal valve, showing cardinal plate and the relative sizes of the crural and fulcral plates. Same as Pl. X. fig. 13. E. Ditto. Hinge-line of internal cast of dorsal valve, showing the cardinalia. Same as Pl. X. fig. 14. Twice natural size.

Shell ornamented by numerous fine ribs, of which about eight are primaries, branching at about half and one-third their length. Ribbing sharply reproduced in the interior of the valves in a marginal zone.

Syntypes.—Nos. 298–301, Geological Department Museum, University of Birmingham.

Dimensions.—Length 12 mm.; width 14 mm.

Horizon.—Upper part of the Lower Longvillian Stage.

I have also collected dalmanellids from the locality given by Bancroft (1928, p. 37) for his *Wattsella* sp. C, *i. e.*, the locality given for fig. 5, Pl. X., and they appear to belong to a species identical with that from the Welsh localities described above. I have seen the material labelled *W. indica* in the Bancroft Collection, British Museum (Natural History), but no specimens were then selected as types, and no description or figures of *W. indica* have as yet been published by Mr. Bancroft. My specimens from the Berwyn Hills appear indistinguishable from Bancroft's specimens, but should Bancroft's 1933 concept of *W. indica*, when fully described, be found not to include my Welsh dalmanellids, Bancroft's form must then be regarded as constituting a new species.

For comparative purposes I have figured material from the locality (*a*) above (Pl. X. figs. 6–7; text-fig. 1, C); locality (*b*) (Pl. X. fig. 4, text-fig. 1, B); and from the Shropshire locality (Pl. X. fig. 5, text-fig. 1, A).

The fine ribbing of *W. indica* easily distinguishes it from *W. horderleyensis* Whittington [ex Bancroft] (see Whittington, 1938, pp. 50–51, pl. vi. figs. 2–7) from a slightly lower horizon. Further, the cardinal process of the latter is a pinched-in ovoid, expanding anteriorly, and the fulcral plate, when compared with the size of the crural plate, relatively smaller than in *W. indica.*

Genus RESSERELLA Bancroft, 1928.

Resserella cruralis, sp. n.

(Pl. X. figs. 8–11.)

Diagnosis.—Shell square in outline, about as wide as long; biconvex; maximum width at about half the length; cardinal angles obtuse. Ventral valve strongly convex, the beak projecting behind the hinge-line; hinge-area triangular, apsacline. Ventral interior with dental plates diverging at 20°, and continued forward by low ridges bounding the muscle-area, which is emarginate in front. Pallial sinuses indistinct.

Dorsal valve gently convex, with a shallow median sinus; hinge-area triangular, anacline; cardinal process broad anteriorly, almost parallel-sided; crural plates short, broad, having the appearance of large circular pits in the cast; muscle-scars prominent, oval in outline, and divided at a little less than half the length by a low ridge, the anterior scars being the larger.

Surface of shell ornamented by angular ribs, of which about eight are primaries, which branch at about one-half and one-third of the length of the shell. Concentric growth-lines are visible at intervals. Internally the ribbing shows as a narrow peripheral zone of furrows in both valves.

Syntypes.—Nos. 302–305, Geological Department Museum, University of Birmingham.

Dimensions.—Length 9 mm.; width 10 mm.

Horizon.—*Resserella cruralis* is characteristic of the Middle Soudleyan rocks immediately above the beds with *Heterorthis retrorsistria.*

Localities.—Old quarry behind Smithy, Bwlch-y-cibau, 2½ miles south-east of Llanfyllin, Montgomeryshire. Quarry behind Hill Cottage, 1 mile south-west of Llansantffraid-ym-Mechain, Montgomeryshire. Crags below Tyn-y-coed Farm, ½ mile north-west of Pen-y-bont, 5 miles north-east of Llanfyllin, Montgomeryshire.

Discussion.—*Resserella cruralis*, sp. n., appears at an horizon in the Caradocian of the south-east Berwyns which is some 400 feet below the beds which first contain *Resserella canalis* (J. de C. Sowerby) (Bancroft, 1929, p. 36; Whittington, 1938, pp. 51–52, pl. vi. figs. 8–12). It differs from the latter in that the length is more nearly equal to the width; internally in *R. cruralis* the cardinal process, which is variable in *R. canalis*, is, so far as is known, always a thick, parallel-sided plate, while the crural plates are thicker as compared with *R. canalis*. In the ventral valve the pallial sinuses, characteristically strongly marked in *R. canalis*, are indistinct in *R. cruralis*.

The forms ascribed to *Dalmanella* (*Resserella*) *argentea* (Hisinger) by Reed (1899, pp. 723, 743), from the Raheen Shales of Co. Waterford, Ireland, are similar in shape and proportions, but the ventral valve of *R. cruralis* has greater convexity, and internally there are several differences. In *R. argentea* the cardinal process is shorter and finer, the crural plates much thinner, and the muscle-scars much less clearly marked.

Genus RAYMONDELLA Bancroft, 1933.

Raymondella typa Bancroft, 1933.

(Pl. X. figs. 12–14.)

1929. *Wattsella* sp. D, Bancroft, B. B., Mem. Proc. Manchester Lit. & Phil. Soc. vol. lxxiii. p. 38.

1933. *Raymondella typa* Bancroft, B. B., 'Correlation Tables of the Stages Costonian-Onnian in England and Wales.' Privately printed.

In collecting from beds immediately above those containing *Wattsella indica* in the Corwen to Glyn Ceiriog outcrop I have obtained a dalmanellid which appears to be characteristic of these beds, and which may be described as follows:—

Diagnosis.—Shell semicircular to subquadrate, width equal to, or greater than, length; cardinal angles obtuse. Ventral valve strongly and evenly convex, beak projecting behind hinge-line; inter-area triangular, apsacline. Ventral interior with two short, strong dental plates diverging at 70°; muscle-areas clearly defined by low ridges running forward from the dental plates, the anterior margin being deeply indented.

Dorsal valve gently convex, with a shallow median depression posteriorly, which broadens and almost disappears anteriorly; inter-area triangular, apsacline; cardinal process spear-shaped, with a small "head" and a short, fine "shaft"; crural and fulcral plates of equal size; muscle-areas oval, on either side of the median sulcus (see text-fig. 1).

Exterior of the shell ornamented by numerous fine ribs, of which about seven are primaries, branching at about half their length. Ornament sharply reproduced in the lateral margins of the shells, and faintly reproduced within this area.

Syntypes.—Nos. 306–308, Geological Department Museum, University of Birmingham.

Dimensions.—

	I.	II.	III.
	mm.	mm.	mm.
Length	10	11	10
Width	10	16	13

Horizon.—The highest Lower Longvillian

In correspondence Mr. Bancroft informed me that his proposed type-locality for *Raymondella typa* is the Quarry at New House, ⅜ of a mile north-north-west of Cheney Longville, Shropshire. The dalmanellids I collected from this locality (see Pl. X. fig. 13; text-fig. 1, D) seem to be identical with my Welsh form (Pl. X. figs. 12, 14; text-fig. 1, E), which latter I therefore provisionally refer to *R. typa*. As no specimens in the Bancroft Collection, British Museum (Natural History), were labelled as the types of *R. typa* when I saw the material, and no description has as yet been published, I have figured both the Welsh and Shropshire form. Should Bancroft's 1933 concept of *R. typa* be found not to include my form, then the Shropshire form is to be regarded as a new species.

The genus *Raymondella* is distinguished from *Wattsella* by having the crural and fulcral plates of nearly equal size. As will be seen from text-fig. 1, *Wattsella indica*, from the beds immediately below, approaches *R. typa* in this respect. In collecting, gradations between the two genera are found, but the average characteristics of the dalmanellids on each of the respective horizons shows that the generic distinction between *W. indica* and *R. typa* may be regarded as valid.

Genus HETERORTHIS Hall & Clarke, 1892.

Heterorthis retrorsistria (M'Coy), 1852.
(Pl. XI. fig. 2.)

1852. *Orthis retrorsistria* M'Coy, Sedgwick, A., & M'Coy F., 'Palæozoic Rocks and Fossils,' p. 224, pl. 1 H, figs. 12–14.

1864. *Orthis alternata* var. *retrorsistria* M'Coy, Davidson, T., 'British Fossil Brachiopoda,' vol. iii. p. 265, pl. xxxvi. figs. 9–42, pl. xxxi. figs. 1–6.

1882. *Orthis retrorsistria* M'Coy, Davidson, T., 'British Fossil Brachiopoda,' vol. v. p. 185, pl. xiv. figs. 7–16.

1922. *Heterorthis alternata* var. *retrorsistria* M'Coy, Elles, G. L., "The Bala Country . . ." Quart. Journ. Geol. Soc. vol. lxxviii. p. 140, footnote.

Discussion.—Since the description by M'Coy in 1852 of "*Orthis*" *retrorsistria* confusion has existed as to whether or not it is to be regarded as specifically distinct from "*Orthis*" *alternata* J. de C. Sowerby, 1839. Davidson first regarded "*O.*" *retrorsistria* as a variety of the latter, but later (1882, p. 185) regarded it as a separate species, Dr. Elles (1922, p. 140, footnote) preferred to accept Davidson's original diagnosis as the more satisfactory.

In the Caradocian outcrops of the southern flanks of the Berwyn Hills, and no doubt at many other localities in North Wales, *Heterorthis retrorsistria* occurs in large numbers at a very well defined horizon in the middle part of the Soudleyan Stage, *i. e.*, about 400 feet below the Pen-y-garnedd Black Shales. In Shropshire *Heterorthis alternata* occurs in large numbers at the well-known "*alternata*" horizon.

It had been thought that the beds with *H. retrorsistria* in North Wales were on the same horizon as the "*alternata*" limestone of Shropshire, but Bancroft's work seems to have shown this view to be erroneous. In discussing the *Wattsella horderleyensis* Super-zone in North Wales and Shropshire, I have already pointed out that in North Wales the *H. retrorsistria* beds are about 400 feet below this zone, and in Shropshire the *H. alternata* beds are about 125 feet above it (1938, p. 50). My field-work on both the south-eastern and northern flanks of the Berwyns has confirmed the presence of other zones claimed by Bancroft (Correlation Tables, 1933), which support a new correlation with the Shropshire succession. Besides the great difference in horizon at which the two forms occur, there are morphological differences between them, about which Mr. Bancroft has written to me as follows :—

"... . the species are most easily distinguished by the characters of the ventral muscle-area. In comparing these characters, of course, we must keep down to the forms from the basal Upper Longvillian and the *Heterorthis* horizon above the *Broeggerolithus-Horderleyella* zone in the Soudleyan. Normal *H. alternata*, and by this I mean 95–100 % of the individuals, always has more or less strongly convex lateral margins to the ventral muscle-scars. In *H. retrorsistria* this lateral convexity is absent or obscure . . . . I certainly regard *H. retrorsistria* and *H. alternata* as distinct species, and should object strongly to the use of a varietal distinction when the forms are remotely separated in time."

I have illustrated this difference between the lateral margins of the ventral muscle-areas of the two species in Pl. XI. figs. 1–2. The difference in the appearance of the muscle-area was noted by Davidson (1882, p. 186), and he also remarks on the smaller size of *H. retrorsistria*, which is a distinguishing character probably of less importance. I am in agreement with Mr. Bancroft's claim that the species are distinct, and the great numbers of each which appear within narrow limits of time make them of great value as zonal indices.

Genus HARKNESSELLA Reed, 1917.

Subgenus REUSCHELLA Bancroft, 1928.

Reuschella oblonga, sp. n.

(Pl. XI. figs. 3–5.)

Diagnosis.—Shell subquadrangular, about two-thirds as long as wide; biconvex; maximum width along hinge-line; cardinal angles rectangular. Ventral valve gently convex, with narrow, "pinched-up," median fold and beak projecting slightly behind hinge-line; hinge-area narrow, triangular, apsacline. Ventral interior with strong dental plates diverging at 80°; muscular area defined by low, broad ridges running forward from the dental plates, and emarginate in front.

Dorsal valve moderately convex, with a deep median sulcus; hinge-area narrow, triangular, anacline; inconspicuous beak. Cardinal process short, broad, ovoid; crural plates short, broad, socket-lines diverging at 90°, presocket-lines converging forwards, sometimes concave anteriorly, indicating the presence of shallow crural pits (text-fig. 2).

Exterior of the valves with moderately fine ribbing, the entire surface covered by concentric striæ.

Dimensions.—Length 18 mm.; width 27 mm.

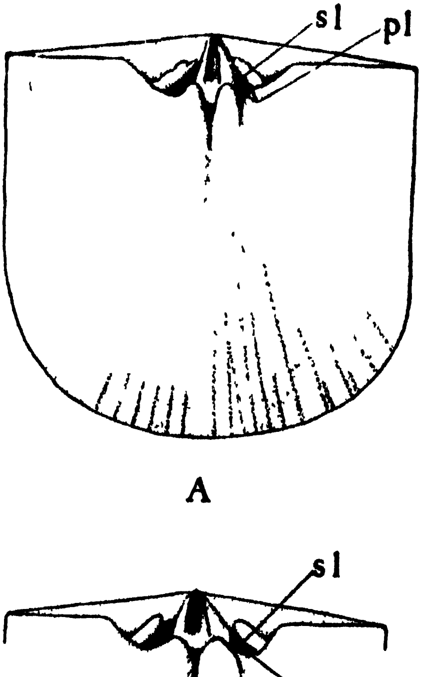
Syntypes.—Nos. 311–313, Geological Department Museum, University of Birmingham.

Horizon.—*Heterorthis retrorsistria* beds of the Lower Soudleyan.

Localities.—Roadside quarry, ⅛ mile west of church at Llanyblodwel. Crags above Garth Wood, 1 mile northwest of Llanyblodwel.

Discussion.—This species is characteristic of the beds with *Heterorthis retrorsistria* in the Llansantffraid district, and occurs in large numbers in blue-grey mudstones and fine sandstones. It seems to be closely allied to *Reuschella horderleyensis* Bancroft (1928, p. 187, pl. ii. figs. 6–8), which occurs in higher beds, and from which it is distinguished principally by its more quadrangular shape and the less conspicuous median fold on the ventral valve.

Text-fig. 2.



A. *Reuschella oblonga*, sp. n. Internal cast of dorsal valve, showing cardinal process and position of socket-lines (*sl*) and presocket-lines (*pl*) which define the bases of attachment of the crural plates. Same as Pl. XI. fig. 3. B Ditto. Hinge-line of internal cast of dorsal valve, showing cardinalia. No. 321. Three times natural size.

Superfamily **STROPHOMENACEA** Schuchert.

Genus SOWERBYELLA Jones, 1928.

Sowerbyella sericea (J. de C. Sowerby) var. nov. *brynensis*.

Diagnosis.—Shell subsemicircular, about half as long as wide; ventral valve moderately convex, dorsal valve almost flat or moderately convex ; cardinal angles between 60° and 80°. Ventral valve with beak projecting slightly behind hinge-line ; inter-area narrow, triangular, apsacline. Ventral interior with dental plates short, well-defined, and enclosing two oval muscle impressions, which extend to one-quarter or one-third the length of the shell ; median septum about 1 mm. long, forking at an acute angle anteriorly, the branches forming the inner boundaries of the muscle-areas. A longitudinal elevation divides each muscle-area into two almost equal parts, and extends forward beyond the muscle impressions. The extra-muscular area is strongly papillose, the margins being characteristically ornamented by well-marked, short, radiating, equidistant furrows.

Dorsal valve with inter-area narrow, triangular, hypercline ; crural bases short, triangular, diverging roughly at 90 and ending abruptly ; muscle impressions pear-shaped, extending to nearly half the length of the valve ; outer boundaries enclosed by distinct ridges ; inner boundaries sharply defined by a pair of submedian septa, which are widest and most prominent anteriorly, and enclose a strong median ridge which extends forward to two-thirds of the length. A longitudinal ridge divides each muscle-area into two unequal parts. Extra-muscular area strongly papillose, the margins being ornamented by furrows as in the ventral interior.

Exterior of the shell covered by fine rounded threads alternating with rather stronger rounded radii. The radii extend from the umbo, where they are not differentiated from the threads, to the margin, and are at fairly constant distances apart, and separated by between five and seven threads near the margin.

Syntypes.—Nos. 314–317, Geological Department Museum, University of Birmingham.

Dimensions.—Length 9 mm. ; width 20 mm.

Horizon.—Upper part of Lower Longvillian and lower part of Upper Longvillian.

Localities.—Loose block from outcrop, 400 feet north-west of Bryn Farm, 1 mile south-east of Glyn Ceiriog, Denbighshire. Old quarry, ¼ mile east of point 822 in Ancient Camp, Bryngwyn Hill, 3 miles east-south-east of Llanfyllin, Montgomeryshire. Locality 24 of Professor W. B. R. King (1938, p. 674).

Discussion.—Professor O. T. Jones has very kindly examined the material described, and he states "your specimens remind me very much of a form which I described on p. 417 of the Survey Monograph (1928), and regarded as probably a gerontic example of *Sowerbyella sericea.* It was obtained from the top of the Chatwall Sandstone at Chatwall. I think your specimens clearly belong to the *sericea* group, and none of the pedicle valves show any trace of crenulation."

The variety *brynensis* differs from *S. sericea* in the pedicle valve by having short, clearly defined muscle-impressions, and in the brachial valve by possessing strongly marked muscle-impressions and the submedian and median septa, while the marginal furrows occurring internally in both valves are characteristic and distinctive. The internal cast of the brachial valve bears a strong general resemblance to *S. sladensis* var. *simulans* Jones, which resemblance is shared by the Chatwall form, as Professor Jones has pointed out (1928, p. 417).

The new variety occurs quite commonly in the beds with *Wattsella indica* and *Raymondella typa* in the Berwyn outcrops, and in the south-eastern area in the overlying beds with a *Nicolella actoniæ* fauna. It probably includes the form from the Chatwall Sandstone, referred to above, and this latter comes from about the "*alternata*" limestone horizon, which is comparable to the horizon on which the Welsh forms occur (see Bancroft, 1933).

Genus SAMPO Öpik, 1933.

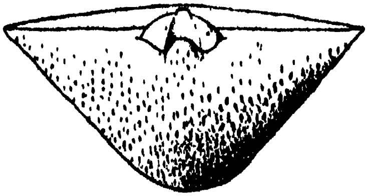
Sampo öpiki, sp. n.

(Pl. X. figs. 15–16; Pl. XI. fig. 10.)

Diagnosis.—Shell subtriangular, about twice as wide as long, greatest width at hinge-line; concavo-convex; cardinal angles about 45°. Ventral valve evenly and moderately convex, lateral portions not flattened; inter-area triangular, apsacline. Ventral interior with a short, broad, heart-shaped muscle impression, extending to not more than a quarter of the length of the valve, and very sharply bounded by a strong ridge. The scars are marked by striations parallel to the anterior and lateral margins of the muscle-area. A pair of broad vascular trunks arise on the muscle-scars, and, crossing the bounding ridge at its most anterior position, run forward a short distance across the shell. A pair of stronger vascular trunks arise at the postero-lateral edges of the muscle impression, run for a short distance parallel to the hinge-line, and then turn forward and disappear. Extra-muscular area covered by fine pustules (see text-fig. 3).

No satisfactory specimen of the dorsal valve has as yet been found, but it appears to be gently concave. The brachial lamellæ (of Öpik, 1933) are sharply defined and slightly overhanging, the margin being emarginate anteriorly, where it runs back to the thick median septum which forms the basis of attachment of the muscles ; the lamellæ and muscle-scars are strongly marked by radial striations which cross the edge of the lamellæ. The interior of the brachial valve outside the lamellæ is probably papillate.

Text-fig. 3.



Sampo opiki, sp. n. Internal cast of ventral valve, showing the muscle impression and the vascular trunks. Same as Pl. X. fig. 16. Four times natural size.

The exterior of the shell is not well preserved in the material collected, but appears to be covered by very fine threads which alternate with stronger, raised, rounded radii. Five strong radii arise at the umbo and run to the lateral margin, other radii arising between these as the margin is approached. The material available does not allow of any statement of the number of threads between radii or per millimetre.

Syntypes.—Nos. 318–320, Geological Department Museum, University of Birmingham.

Dimensions.—Length 6 mm. ; width 12 mm.

Horizon.—The lower part of the Upper Longvillian, *i. e.*, the beds with a *Nicolella actoniæ* fauna.

Localities.—Old quarry ¼ mile east of point 822 in Ancient Camp, Bryngwyn Hill, 3 miles east-south-east of Llanfyllin, Montgomeryshire. Old quarry on the south edge of Greenhall Park, Llanfyllin, Montgomeryshire.

Discussion.—The internal characters of this species seem to warrant its reference to the genus *Sampo* Öpik, 1933. There are, however, several features which distinguish it from *Sampo hiiuensis* Öpik, though the general appearances are similar. In the pedicle valve the new species has not, so far as my material shows, a crenulated hinge-line, but the shape of the muscle-area and the vascular trunks running forward from it are very similar. The pair of trunks which in *S. öpiki* run parallel to the hinge-line are not seen in *S. hiiuensis.* The brachial valve is probably more gently and evenly concave in the new species, but the brachial lamellæ with the raised median muscle-area have the same general shape. Further, the proportion of width to length is two to one in the new species, whereas *S. hiiuensis* is 17 mm. wide and 13 mm. long.

Sampo ruralis (Reed), 1917, is the only other species of this genus so far described in this country. It is of larger size and differing proportions—10–12 mm. long and 18–20 mm. wide (Reed, 1917, p. 880)—to *S. öpiki.* The pedicle valve of the two species are very similar, both possessing the two pairs of vascular trunks, but the hinge-area of *S. öpiki* is not in the plane of the valve and the valve itself is much less strongly convex. The brachial valves are, so far as they can be compared, somewhat similar., *S. ruralis* has not been recorded from beds of other than Ashgillian age, but the known horizon of the new form is considerably lower.

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EXPLANATION OF THE PLATES.

PLATE X.

Fig. 1. No. 295. *Orthis calligramma* Dalman var. nov. *berwynensis*. Syntype. Internal cast of dorsal valve. Quarry on north side of road, ½ mile east of Pen-y-rhiw, 1¼ miles north-west of Llanyblodwel, Shropshire.

Fig. 2. No. 296. Ditto. Internal cast of ventral valve. Roadside quarry, ¼ mile west of Llanyblodwel Church.

Fig. 3. No. 297. Ditto. Plasticine mould of exterior of ventral valve. Same locality.

Fig. 4. No. 298. *Wattsella indica* Bancroft. Syntype. Internal cast of dorsal valve. Old quarry ¼ mile east of point 822 in Ancient Camp, Bryngwyn Hill, 3 miles east-south-east of Llanfyllin, Montgomeryshire.

Fig. 5. No. 299. Ditto. Quarry on north-west side of Longville Plantation, ½ mile west-north-west of Cheney Longville, Shropshire.

Fig. 6. No. 300. Ditto. Mudstones between ash and conglomerate, quarry at Bryn Farm, 1 mile south-east of Glyn Ceiriog, Denbighshire.

Fig. 7. No. 301. Ditto. Internal cast of ventral valve. Same locality.

Fig. 8. No. 302. *Resserella cruralis*, sp. n. Syntype. External cast of dorsal valve. Quarry behind Hill Cottage, 1 mile south-west of Llansantffraid-ym-Mechain, Montgomeryshire.

Fig. 9. No. 303. Ditto. Internal cast of ventral valve. Old quarry behind Smithy, Bwlch-y-cibau, 2½ miles south-east of Llanfyllin, Montgomeryshire.

Fig. 10. No. 304. Ditto. Internal cast of dorsal valve. Locality as fig. 8.

Fig. 11. No. 305. Ditto. Locality as fig. 9.

Fig. 12. No. 306. *Raymondella typa* Bancroft. Syntype. Internal cast of ventral valve. Crag 330 feet south-east of Pen-y-graig Farm, 1 mile south of Glyn Ceiriog, Denbighshire.

Fig. 13. No. 307. Ditto. Internal cast of dorsal valve. Quarry at New House, ¾ mile north-west of Cheney Longville, Shropshire.

Fig. 14. No. 308. Ditto. Loose block from outcrop, 400 feet north-west of Bryn Farm, 1 mile south-east of Glyn Ceiriog.

Fig. 15. No. 318. *Sampo öpiki*, sp. n. Syntype. Internal cast of the ventral valve. Locality as fig. 4.

Fig. 16. No. 319. Ditto.

All figures twice natural size.

PLATE XI.

Fig. 1. No. 309. *Heterorthis alternata* (J. de C. Sowerby). Internal cast of ventral valve. "*Alternata*" limestone, Soudley Quarry, Hope Bowdler, Shropshire.

Fig. 2. No. 310. *Heterorthis retrorsistria* (M'Coy). Internal cast of ventral valve. Locality as fig. 2, Pl. X.

Fig. 3. No. 311. *Reuschella oblonga*, sp. n. Syntype. Internal cast of dorsal valve. Locality as fig. 2, Pl. X.

Fig. 4. No. 312. Ditto. Plasticine mould of exterior of ventral valve. Same locality.

Fig. 5. No. 313. Ditto. Internal cast of ventral valve. Same locality.

Fig. 6. No. 314. *Sowerbyella sericea* (J. de C. Sowerby) var. nov. *brynensis*. Syntype. Internal cast of ventral valve. Crags in wood behind Goetre, ¼ mile north-west of Meifod, Montgomeryshire (locality 24 of King, 1928, p. 674).

Fig. 7. No. 315. Ditto. Locality as fig. 4, Pl. X.

Fig. 8. No. 316. Ditto. Internal cast of dorsal valve. Locality as fig. 14, Pl. X.

Fig. 9. No. 317. Ditto. Exterior of dorsal valve. Locality as fig. 14, Pl X.

Fig. 10. No. 320. *Sampo öpiki*, sp. n. Syntype. Plasticine mould of exterior of ventral valve. Locality as fig. 4, Pl. X.

All figures twice natural size.

XXVI.—*New and little-known False-Scorpions from the Pacific and elsewhere.* (*Arachnida–Chelonethida*). By JOSEPH C. CHAMBERLIN *, Associate Entomologist, U.S. Department of Agriculture, Bureau of Entomology and Plant Quarantine, Corvallis, Oregon.

IN the following paper I have taken the opportunity of describing some new species of false-scorpions from Fiji, Samoa, and Hawaii, together with some species intercepted in quarantine in Hawaii and New York.

* My acknowledgments are due to E. P. Mumford, of the Pacific Entomological Survey; E. H. Bryan, Jr., of the Bishop Museum; Harold Hagan, then of the Hawaiian Pineapple Growers Association of Honolulu; and Harold E. Morrison and C. F. W. Muesebeck, of the Bureau of Entomology and Plant Quarantine of the U.S. Department of Agriculture, for the privilege of studying the material upon which this report is based.

I have also added incidentally some notes on a further species from Hawaii, *Lophochernes cryptus* Chamberlin, and on the reputedly nearly cosmopolitan *Cheiridium (Cheiridium) museorum* (Leach).

Suborder DIPLOSPHYRONIDA Chamberlin.

Superfamily **NEOBISIOIDEA** Chamberlin.

Family **Neobisiidæ** Chamberlin.

Subfamily *NEOBISIINÆ* Chamberlin.

PARARONCUS, gen. nov. (Fig. 1.)

Orthotype. *Pararoncus histrionicus*, sp. n. Japan.

Diagnosis.- Neobisiine genus close to *Roncus*, from which it differs primarily in the chætotaxy of the maxilla, etc. At present known only from the orthotype. With two weakly developed eyes; carapace longer than broad and with a distinct epistomal process; tergites with a marginal series of about 16 setæ; sternites with about 20 setæ. Tergites and sternites each with a pair of lateral discal setæ anterior to the marginal series. Apical maxillary process of coxa i. prominent, very acute, and strongly sclerotic (fig. 1 E). Apical margin of maxilla with only two setæ (fig. 1 D). Tarsus iv. with a subbasal tactile seta. Subterminal seta forked. Galeal tubercle absent (always ?) (fig. 1 F); palm of chelicera with four or five accessory setæ. Palps (fig. 1 G) of normal form. Marginal teeth of chela numerous, close-set, and contiguous (fig. 1 A). Movable finger with prominently crested receptor venedens comprising four offset and elevated marginal teeth (figs. 1 A & B). Exteriorly opposite, but closely proximate to, the 21st and 22nd marginal teeth (exclusive of those comprising the receptor venedens) and slightly posterior to seta T is a small, lobe-like, sclerotic accessory tooth or process of unknown but possibly sensory function (figs. 1 A & C). Chætotaxy of chela as illustrated (fig. 1 A); seta SB as close to ST as to B and ISB clearly nearer to IB than to IST, otherwise essentially as in *Roncus*.

Remarks.—The lobe-like accessory tooth or sensorium of the movable finger, described above and shown in figs. 1 A & C, is unique to my knowledge. It is conceivably of only specific value. The new genus may be separated from the others of the subfamily by means of the following key :—

1.	Chætotaxy of chela of adult comprising the normal number of setæ (eight on the fixed, four on the movable finger)	2.
	Chætotaxy of chela of adult comprising a reduced number of setæ (fixed with six or seven, movable with three setæ)	5.
2.	Manducatory process of maxilla with but two apical setæ	3.
	Manducatory process of maxilla with four or five apical setæ	4.
3.	Seta IB opposite ESB and distad of EB ; seta IST median, but between EST and ISB and as close to the latter as to IT ; epistomal process present ; with two small eyes ; palpi slender, but normal (fig. 1G) ; movable finger of chela with an accessory tooth-like sensorium near seta T (fig. 1C).	*Pararoncus*, gen. nov.
	Seta IB distinctly proximad of EB and situated on the distal part of the hand ; seta IST only slightly proximad of EST and much closer to IT than to ISB ; epistomal process absent ; palpi excessively slender and elongate ; movable finger of chela without such a sensorium.........	*Pseudoblothrus* Beier *.
4.	With four eyes or eyeless, in the latter case the bulb of the tibia not sharply differentiated from the pedicel ; IST grouped with ET, EST, and IT to form a distal group of four setæ widely separated from the similar but distinct basal group comprising ESB, EB, ISB, and IB	*Neobisium* Chamberlin
	With two eyes or eyeless, in the latter case the bulb of the tibia sharply differentiated from its pedicel ; IST and ISB more or less submedian, thus connecting the terminal and basal setal groups comprising ET, EST, IT, and ESB, EB, and IB, respectively..........................	*Roncus* L. Koch.
5.	Fixed finger of chela with seven and movable finger with three tactile setæ (ISB and SB absent) ; manducatory process of maxilla with three apical setæ	*Microbisium* Chamberlin.
	Fixed finger of chela with six, movable with three tactile setæ (IB, ISB, and SB absent)	*Afrobisium* Beier

Pararoncus histrionicus, sp. n.

(Fig. 1.)

Holotype. Female (JC. 798.01001). From Japan. Taken at quarantine in Hawaii (lot 3985) and transmitted to me by R. V. Chamberlin in May, 1932. No additional material known. Author's collection.

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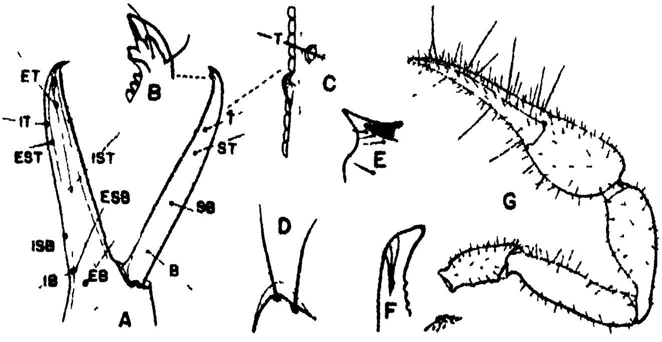
* Data secured since the preparation of this paper indicates that *Pseudoblothrus* belongs to the family Syarinidæ rather than the Neobisiidæ.

Diagnosis.—Carapace longer than broad, with two very small eyes situated almost three ocular diameters from the anterior carapacal margin; epistomal process prominent. Carapacal chætotaxy: 4–8 (36±). Tergal chætotaxy (marginal series only):

12 : 15 : 14 : 14 : 15 : 16 : 16 : 18 : 14.

All tergites but the first with a pair of longitudinally opposite lateral discal setæ on each side of each tergite anterior to the marginal series. Manducatory process of maxilla rounded as usual in this subfamily, but provided with only two stout apical setæ instead of the usual four or five (fig. 1 D). Coxal area broadest across the maxillæ and first coxæ and extending posteriorly to point opposite the posterior margin of the second tergite. Palps (fig. 1 G) slender; all segments distinctly and evenly but not prominently granulate; inner face or femur, tibia, and hand more so than the rest; trochanter slender with straight nearly parallel sides, 2·5 times as long as broad; femur shorter than fingers, slightly but distinctly longer than tibia, and almost or quite as long as

Fig. 1.



Pararoncus histrionicus, gen. et sp. n. (female, holotype).

A. Extero-lateral aspect of right chela. B. Detail of movable finger of chela showing the venedens receptor. C. Accessory tooth or sensorium on movable finger of chela. D. Ventral aspect of tip of maxilla. E. Apical process of first coxa, ventral aspect. F. Tip of movable finger of chelicera, showing absence of spinneret and debouchment of the silk glands. G. Ventral aspect of left pedipalp carapace, 3·9–4·0 times as long as broad ; femur distinctly pedicellate, rounded exteriorly, convex interiorly near base and middle, then distally slightly concave ; tibia pedicellate and slenderly convex both interiorly and exteriorly, 2·7–2·8 times as long as broad ; chela slender, exteriorly hand and fingers forming a nearly straight contour from base to tip, hand smoothly convex interiorly ; chela 3·7–3·8 times as long as broad ; hand 1·4 times as long as broad and only very slightly deeper than broad ; marginal teeth of fixed finger numbering 63 64, all well developed and with rounded apices, scarcely less well developed posteriorly than anteriorly ; movable finger with 57 contiguous marginal teeth (exclusive of those forming the receptor venedens), which are only slightly less well developed than those of fixed finger (fig. 1 A). Receptor venedens comprising the first four marginal teeth, which have been raised on a crest and offset from the terminal tooth (fig. 1 B).

Measurements (mm.).—Female. Total length (KOH-cleared) 3·0. Carapace ·70 long; breadth (exact) indet. Palps : trochanter ·438×·175·; femur 682×·172 ; tibia ·654×·236 ; chela 1·180×·318 broad and ·325 deep ; hand ·447 long ; fingers ·723 long. Leg i. : femur pars basalis ·375×·124 ; femur pars tibialis ·264×·118 ; tibia ·348×·084 ; metatarsus ·184×·068 ; tarsus ·285×·070. Leg iv. : femur (both segments as unit), dorsal length ·582, greatest length ·639, depth ·199 ; tibia ·595×·114 ; metatarsus ·236×·085 ; tarsus ·344×·082.

Remarks.—In addition to the foregoing characterization, the movable finger is exteriorly provided with a low, smooth crest or tooth-like outgrowth of probable sensory function which lies opposite, and almost contiguous to, the 21st and 22nd marginal teeth as already described under the generic heading (see also fig. 1 C). This structure, which is without known parallel in the suborder, is not conspicuous, scarcely exceeding the marginal teeth in height. It is noteworthy as occurring in the female (male as yet unknown). In some respects this species resembles *Roncus* (*Roncus*) *japonicus* (Ellingsen), but it differs in the size and proportions of the palpal segments. This difference may be due in part to differences in the methods of taking the measurements, and it is barely possible that re-study of Ellingsen's material may, indeed, show the two to be conspecific.

Suborder MONOSPHYRONIDA Chamberlin.

Superfamily **CHEIRIDIOIDEA** Chamberlin.

Family **Cheiridiidæ** Chamberlin.

1931. Cheiridiidæ Chamberlin, Stan. Univ. Pub. Univ. Ser. Biol. sci. 7 (1) p. 236.
1932. Cheiridiinæ Beier, 'Das Tierreich,' lviii. p. 6.

Remarks.– Chamberlin (1924), in his diagnosis of the subfamily Cheiridiinæ (the present Cheiridiidæ), stated that the venom apparatus was lacking. In 1931 (Chamberlin, p. 132 and p. 236) this opinion was revised and the statement made that it occurred in the fixed finger only. This statement now requires a still further revision, since it has been definitely observed to occur in both fingers of at least one of the species here described, *Cheiridium minor*, sp. n., and is apparently, although not conclusively, also present in both fingers of *C. simulacrum*, sp. n. It seems to be truly lacking in the movable finger of species of *Apocheiridium*, although this requires verification. It would therefore not appear to be of higher than generic or perhaps subfamily value in this group. Its presence, however, is always exceedingly difficult to demonstrate completely in any species of the family I have yet observed, and, regardless of final conclusions, its systematic use will always be difficult. Further comparative studies are needed.

Beier (*l. c.*) has reduced the families Cheiridiidæ and Pseudocheiridiidæ as recognized by me to subfamily rank under the family Cheiridiidæ. This decision is one in which I cannot concur without more ample justification than is apparent from his publications. He makes the change without discussion or comment.

CHEIRIDIUM Menge. (Fig. 2.)

1855. *Cheiridium* Menge, N. Schr. Naturf. Gesell. Danzig, v. (2) p. 36.
1924. *Cheiridium* Chamberlin, Pan Pac. Ent. i. p. 37.
1931. *Cheiridium* Chamberlin, Stanford Univ. Pubs. Univ. Ser. Biol. Sci. vii. (1) p. 237.
1932. *Cheiridium* Beier, 'Das Tierreich,' lviii. p. 7.

Logotype. *Chelifer museorum* Leach.

Remarks.—Since its restricted definition by Chamberlin in 1924, this interesting genus has been considered monotypic, except for the fossil species *C. hartmanni* from the Baltic amber. Two additional well-marked species are here added, one from Hawaii and one presumably from

China. The latter represents a distinct subgenus, *Isocheiridium*, nov.

It is to be noted that the galea is sexually dimorphic in all species of this genus, comprising a simple unbranched stylet in the male and a slender, terminally trifid structure in the female (fig. 1 D). The serrula exterior has nine blades in each of the three known species. The two subgenera and three species here recognized may be separated by means of the following key. It should be noted that the proportions given are based upon palpal measurements which include the granulations; also that those for *C. museorum* are based upon male examples only, and those for *C. simulacrum* upon a single female specimen.

1. Vestitural setæ of palps strongly arcuate and exteriorly minutely multidenticulate (fig. 2 G); tergal setæ crenately lanceolate; setæ ISB and IB of chela distinctly distad of ESB and EB (about one areolar diameter); EST about opposite IST (fig. 2 A). .... *Isocheiridium minor*, [subgen. et sp. n.

Vestitural setæ of palps arcuate but only monodenticulate (figs. 2 F & H); tergal setæ slender, strongly arcuate and acuminate (possibly minutely monodenticulate); setæ ISB and IB of chela scarcely or not at all distad of ESB and EB, nearly opposite; EST slightly but distinctly distad of IST (figs. 2 B & E) .... (*Cheiridium*, [subgen. typ.) 2.

2. Tibia 2·88 times as long as broad; palps relatively conspicuously granulate, height of the granulations proximally on inner femoral margin almost 1/5 as great as length of vestitural setæ of same part (fig. 2 F); fingers distinctly longer than hand without pedicel. fourth femur slightly narrower than breadth of palpal femur (including granulations) and 4·2 times as long as deep .... *museorum* (Leach)

Tibia 2·54 times as long as broad; proximal granulations of inner femoral margin low, their height scarcely 1/10–1/15 length of individual vestitural setæ of same part (fig. 2 H); fingers and hand of nearly equal length; fourth femur slightly deeper than breadth of palpal femur (including granulations) and 3·4 times as long as deep .... *simulacrum*, sp. n.

CHEIRIDIUM, subgen. typ.

Logotype. *Chelifer museorum* Leach.

Diagnosis.—Vestitural setæ of palps each strongly arcuate and with a small single denticle on exterior part of curve (figs. 2 F & H); vestitural setæ of tergites arcuate and acuminate (possibly minutely monodenticulate); seta ISB opposite EB and ESB; IB slightly distad of these three; seta EST slightly to distinctly distad of IST (figs. 2 B & E).

Cheiridium (*Cheiridium*) *museorum* (Leach).

(Figs. 2 E, F, & L.)

References.—See Beier, ' Das Tierreich,' lviii. p. 8, 1932, for literature citations concerning this species.

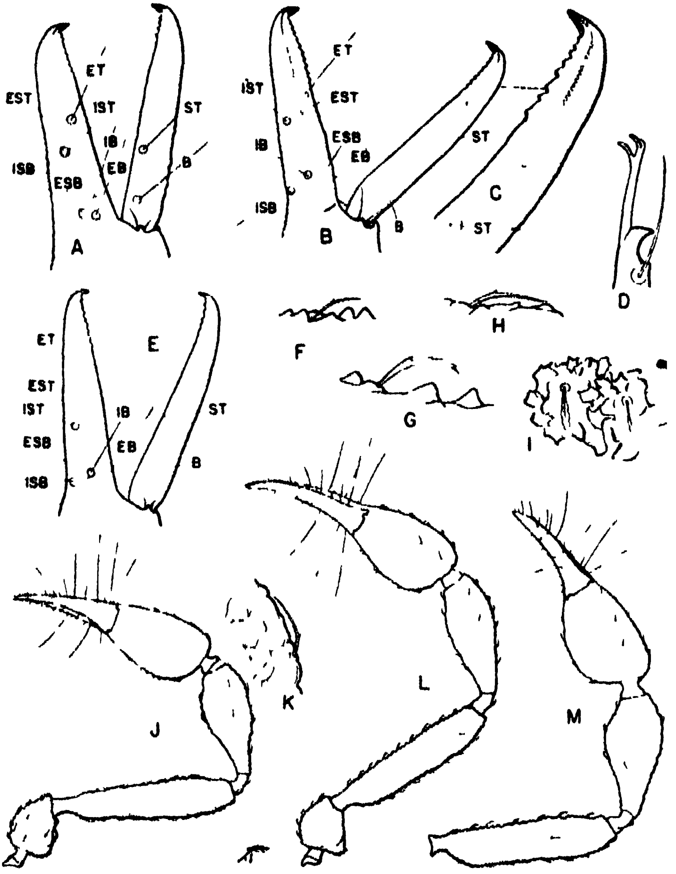
Remarks.—The principal appendicular proportions of this species, the reputedly nearly cosmopolitan book scorpion, are (length divided by breadth unless otherwise stated): Palps: trochanter 1·36; femur 4·58; tibia 2·88; chela 3·32 (3·93 times as long as deep), fingers 1·18 times as long as hand, depth of hand ·84 of breadth. Leg i. (length by depth): femur 3·35; tibia 3·36; tarsus 4·60; tibia and tarsus subequal in length. Leg iv. (length by depth); femur 4·25; tibia 4·70; tarsus 5·40; tibia 1·13 times as long as tarsus.

Measurements (mm.).—Total length 1·18. Abdominal breadth ·75. Carapace ·331 long by ·368 broad behind; cucullus ·074 long. Palps: trochanter ·158 × ·116; femur ·354 × ·075; tibia ·278 × ·094; chela ·438 × ·131 broad and ·111 deep; hand ·204 long; fingers ·242 long. Leg i. (male specimen 189·01002): femur, ·210 × ·070; tibia ·155 × ·046; tarsus ·153 × ·033. Leg iv.: femur ·298 × ·070; tibia ·223 × ·048; tarsus ·198 × ·037.

These measurements, unless otherwise noted, are from a KOH-cleared male specimen from France (JC. 189.01001). They differ to some extent from those published by Beier (*l. c.*). Any significant discrepancy is in all probability due to difference in the method of taking the measurements. As Beier does not give his points of reference, verification is impossible. Moreover, the granulation, of the palpal segments especially, makes consistent results rather difficult.

The marginal teeth of the chela number about nine, and are best developed just proximad of the terminal tooth on each finger; the two basal teeth on the movable finger are nearly obsolete.

Fig. 2.



Cheiridium (*Cheiridium*) *museorum* (Leach) (male). E. Interior aspect of left chela (partially reconstructed). F. Vestitural setæ and granulations from outer base of palpal femur. L. Ventral aspect of left palp (JC. 189.01002).

Cheiridium (*Cheiridium*) *simulacrum*, sp. n. (female, holotype). B. Interior aspect of left chela. C. Tip of movable finger of chela showing venom apparatus. D. Tip of movable finger of chelicera showing the galea. H. Vestitural setæ and granulations from outer base of palpal femur. J. Ventral aspect of left palp. K. Vestitural seta and plaque-like granulations of palpal tibia.

Cheiridium (*Isocheiridium*) *minor*, sp. n. (female, allotype). A. Exterior aspect of right chela. G. Vestitural setæ and granulations from outer base of palpal femur. I. Typical tergal setæ. M. Ventral aspect of left palp. Trochanter omitted.

For purposes of comparison with the new species herein described, the palps (fig. 2 L), the chela (fig. 2 E), and a femoral seta (fig. 2 F) are illustrated herein.

Cheiridium (*Cheiridium*) *simulacrum*, sp. n.
(Figs. 2, B, C, D, H, J, & K.)

Holotype. Female (JC. 791.01001) collected October 1, 1931, in house at Wahiawa, Oahu, Hawaii, by H. Hagan. No additional material available. Author's collection.

Diagnosis. —General facies that of *Cheiridium museorum*, to which without doubt it is closely related. Carapace 1·3 times as broad behind as long and 5·1 times as long as cucullus; cucullus about 2·4 times as long as ocular diameter; emarginate median depression of posterior disc of carapace pronounced, longer than broad and ovate in outline. Tergites bordered by 18–20 marginal setæ. Sub-basal seta of chelicera subapically dentate as in *C. museorum*; serrula exterior with nine ligulate teeth, of which the basal is very much broader and somewhat longer than the rest (as in *C. museorum*); fixed finger of chelicera with three large and two small marginal teeth; galea long and slender and extending beyond tip of galeal seta, apically with three short, scarcely recurved branches; flagellum as in *C. ferumoides*. Palps less granular than in *C. museorum*, the individual granules more or less squamose (fig. 2 K) and both absolutely, as well as relative to the setæ, of lower relief than in *C. museorum* (fig. 2, compare H and F); vestitural setæ of palps similar to those of *C. museorum*, but much more closely appressed to the segment (fig. 2 J); tibia markedly shortened owing to pronounced initial bend in tibial pedicel and fingers subequal to hand in length; palpal appearance otherwise same as that of *C. museorum* (fig. 2, compare J and L). Palpal proportions: trochanter 1·52 times as long as broad, longer than tarsus of leg i. but shorter than that of leg iv.; femur gently expanded from base for three-fourths its length, thereafter suddenly narrowed, 4·6 times as long as broad; tibia conspicuously pedicellate, the expansion of the pedicel into the bulb occurring about one-third the length of the segment from its base, 2·54 times as long as broad, pedicel more acutely angled than in *C. museorum* (figs. 2 J & L);

chela (without pedicel) 3·40 times as long as broad and 4·18 times as long as deep; hand (without pedicel) subequal in length to fingers and 1·71 times as long as broad. Chætotaxy and venom apparatus of chela as illustrated (fig. 2 B); marginal teeth of chela inconspicuous and occurring on apical third of fingers, 10 on fixed and 8 on movable fingers (figs. 2 B & C).

Femur of leg i. about as long as tibia of fourth leg and 3·1 times as long as deep; tibia and tarsus of fore legs of about the same length; tibia 3·6 times as long as deep; tarsus 4·9 times as long as deep. Leg iv.: femur slightly deeper than greatest breadth of palpal femur and 3·4 times as long as deep; tibia but little longer than tarsus (1·04 times), shorter than length of palpal fingers, and 4·4 times as long as deep; tarsus 6·0 times as long as deep.

Measurements (mm.).—Female holotype. Total length, 1·12. Abdominal breadth ·76. Carapace ·320 long by ·420 broad behind; cucullus ·063 long; ocular diameter ·026. Palps: trochanter ·162 × ·103; femur ·355 × ·077; tibia ·260 × ·102; chela ·430 × ·127 broad and ·103 deep; fingers ·221 long; hand (without pedicel) ·208 long. Leg i.: femur ·195 × ·062; tibia ·146 × ·040; tarsus ·144 × ·029. Leg iv.: femur ·272 × ·079; tibia ·195 × ·044; tarsus ·188 × ·031.

Remarks.—The most important points of difference between this species and *museorum* are given in the full in the preceding key. It is important to note that the proportions given for *C. museorum* are based upon males, whereas the present species is known only from the female. With both sexes available differences might be either more or less distinct.

ISOCHEIRIDIUM, subgen. nov.

Orthotype. *Cheiridium (Isocheiridium) minor*, sp. n.

Diagnosis.—Vestitural setæ of palps arcuate and minutely multidenticulate along outer curve (fig. 2 G); vestitural setæ of carapace and tergites apparently not markedly arcuate and distinctly oblanceolate or spatulate with crenate edges (fig. 2 I); setæ IB and ISB almost opposite and both distinctly anterior to EB and ESB; EST opposite IST (fig. 2 A).

Cheiridium (Isocheiridium) minor, sp. n.
(Figs. 2 A, G, I, & M.)

Type-material.—Holotype, male (JC. 856.01001); allotype, female (JC. 856.01002). Found on leaves of *Lophærum gracile* from China. Taken alive May 27, 1936, at quarantine in New York City, cargo of SS. 'President Lincoln,' by Inspector Sartor. (N.Y. Entry No. 842142-3. Bureau of Entomology and Plant Quarantine No. 36-16756.) No other material known. Author's collection.

Diagnosis (both male and female unless otherwise noted). - Facies typical; very similar in general appearance to, but smaller than, *Cheiridium museorum*. Carapace typical; median depression of posterior disc pronounced and extending to and involving the first tergite; appearance in most respects as in the genotype. Vestitural setæ of palps arcuate and with 3–5 denticles along outer curve (fig. 2 G). Median tergites with 18–20 marginal setæ in female and 14–16 in male. Tergal setæ crenately margined and oblanceolate in form (fig. 2 I). Chelicerae typical of genus; galea slender, a simple acuminate shaft in male, but with at least two, and more probably three, short, recurved, terminal branches in female; serrula exterior with nine blades, of which the basal one is widened and spatulate; flagellum as in *C. museorum*. Cheliceral chætotaxy: *ls* absent, *b* apparently non-denticulate. Palps typical; granulation pronounced, much as in *C. museorum*; trochanter 1·3–1·4 times as long as broad; femur distinctly broadest distally, 4·0 (in male) and 4·5–4·6 (in female) times as long as broad; tibia rather robust, 2·4–2·5 times as long as broad; chela, without pedicel, 2·9–3·0 times as long as broad, and 3·3 times as long as deep; hand, with pedicel, 1·65–1·69 times as long as broad; hand, with pedicel, distinctly longer than fingers, without pedicel slightly longer than fingers, but practically subequal thereto. Chætotaxy of chela as figured (fig. 2 A). Marginal teeth of chela almost vestigial on movable finger, but apical tooth well developed and acute and with about four nearly terminal marginal teeth; seven or eight weakly developed teeth occurring distally on fixed finger (fig. 2 A). Leg i.: femur subequal to fourth tibia, 3·1–3·2 times as long as deep; tibia slightly longer than tarsus and 3·4 times as long as deep; tarsus 4·6–4·8 times as long as deep. Leg iv: femur longer than palpal tibia, 3·5 (male)–3·7 (female) times as long as deep; tibia but little longer than tarsus (1·05–1·09 times) and 4·3–4·4 times as long as deep; tarsus 5·8–6·0 times as long as deep.

Measurements (mm.).—Male. Total length, ·93. Abdominal breadth ·65. Carapace ·29 long, breadth indet.; cucullus ·052 long; ocular diameter ·022. Palps: trochanter ·104–·114 × ·081–·083; femur ·265–267 × ·063–066; tibia ·212–·214 × ·085; chela ·316 × ·107 broad and ·096 deep; hand ·158 long (with pedicel ·177); fingers ·166 long. Leg i: femur ·147 × ·048; tibia ·112 × ·033; tarsus ·110 × ·023. Leg iv.: femur ·219 × ·062; tibia ·162 × ·037; tarsus ·155 × ·0266.

Female. Total length about 1·0. Abdominal breadth ·77. Carapace indet. Palps: trochanter ·114–·120 × ·085; femur ·291 × ·063–·064; tibia ·217–·219 × ·091; chela ·328–·330 × ·112–·113 broad and ·099 deep; hand ·169 long (with pedicel ·190); fingers ·162 long. Leg i.: femur ·165 × ·051; tibia ·121 × ·036; tarsus ·118 × ·026. Leg. iv.: femur ·232 × ·062; tibia ·177 × ·040; tarsus ·162 × ·027.

Remarks.—In addition to many good morphological characters, the small size of this species renders it distinctive (femoral length ·26–·29 mm. as compared with ·35–·36 mm. in *C. simulacrum* and *C. museorum*). It may be noted that the essential pattern of the male genitalia is the same as in *C. museorum*.

Superfamily **CHELIFEROIDEA** Chamberlin.

Family **Chernetidae** Chamberlin.

Subfamily *CHERNETINÆ* Beier.

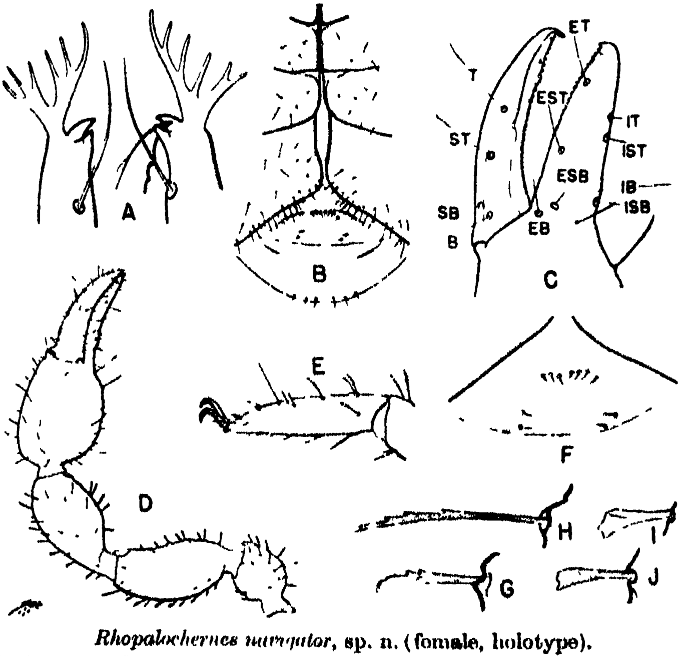
Rhopalochernes navigator, sp. n.

(Fig. 3.)

Holotype. Female (JC. 812.01001), Tutuila, Samoa. Taken at quarantine inspection in Hawaii (lot 4827), Aug. 4, 1932. Deposited in Bishop Museum.

Diagnosis.—Carapace and tergites evenly granulate; carapace shorter than posterior breadth; eyeless (eye-spots apparently also absent). Carapacal furrows weakly impressed, anterior furrow submedian and gently procurved; posterior furrow typical; tergites divided with exception of first and eleventh; scuta "deliquescently" merging into the intersocleritic membranes; vestitural setæ of carapace and tergites strongly clavate (fig. 3 I); tergites 1-3 uniseriate, the rest uniseriate except for the customary lateral discal seta on each scutum; with about ten marginal setæ each (five per scutum); sternites 4–11 divided by an obscure stripe; sternites smooth and with about 20 acuminate border setæ per sternite (ten per scutum), lateral discal setæ of sternites 8, 9, and 10 moderately elongate and denticulo-clavate (most other sternal setæ acuminate); sternite 11 with a short lateral

Fig. 3.



Rhopalochernes navigator, sp. n. (female, holotype).

A. Subventral aspect of left and right galeæ. B. Pseudosternum and female genital area. C. Externo-lateral aspect of left chela. D. Ventral aspect of right palp. E. Lateral aspect of fourth tarsus. F. Genital area of female. G and J. Vestitural setæ from femur of palps. H. Semitactile vestitural seta from inner face of chela at base of fixed finger. I. Tergal seta.

(Figs. G, H, I, and J drawn to same scale.)

and submedian pair of acuminate pseudotactile setæ; tergites 10 and 11 with lateral discal setæ elongated but still strongly denticulo-clavate; tergite 11 with a submedian pair of similarly elongated clavate setæ and possibly with a similar (or acuminate ?) lateral pair as well (broken from only available specimen). Pleural and intersclerotic membranes markedly wrinkled and hispid. Anus wholly ventral. Maxillary disc smooth. Coxal area broadest across posterior border of second coxæ; intercoxal space between posterior portion of coxæ 3 and anterior portion of coxæ 4 about four or five times as broad as space between posterior portion of fourth coxæ or between the other pedal coxæ, thus delimiting a small and elongate, but definite pseudosternum (fig. 3 B). Setæ *sb* and *b* of chelicera terminally denticulate; seta *es* acuminate; flagellum 3-bladed, the anterior blade slender, but still nearly as broad as the combined width of the other two, anteriorly serrate; serrula exterior with 16 blades; galea antler-like with six branches, which may differ bilaterally on the same specimen but still retain the characteristic facies (fig. 3 A). Palps (fig. 3 D) relatively robust, evenly but rather coarsely granulate, and vestitured by moderately robust semiclavate setæ (figs. 3 G, H, & J); trochanter 1·64 times as long as broad; femur scarcely longer than tibia, 1·53 times as long as trochanter and 2·30 times as long as broad; tibia about as long as hand with pedicel and 2·10 times as long as broad; chela robust, longer than breadth of carapace, 1·63 times as long as tibia and 2·50 times as long as broad; fingers very slightly shorter than hand (exclusive of pedicel); chela with tactile setæ as shown in fig. 3 C; nodus ramosus of venom apparatus slightly proximad of seta T; movable finger with 31, fixed finger with 27 or 28, marginal teeth; movable finger with four evenly spaced accessory teeth anterior to nodus ramosus and closely parallel to marginal series; fixed finger with three similar accessory teeth, the basal one of which is slightly proximad of seta ET; sense-spots inconspicuous; a series of three occurring exteriorly on fixed finger between setæ ET and EST; a single small sense-spot exteriorly on movable finger between setæ ST and SB; interiorly with two or three sense-spots on base of movable finger. Leg i.: femur (dorsal length of both subsegments) a little longer than breadth of chela an 2·56 times as long as deep; tibia ·9 as long as tarsus about as long as breadth of palpal tibia, and 2·8 times as long as deep; tarsus slightly longer than tibia and 4·3 times as long as deep. Leg iv.: femur (greatest length of combined subsegments) 1·35 times as long as tibia and 3·36 times as long as deep; tibia 1·12 times as long as tarsus and 3·9 times as long as deep, tarsus 4·4–4·5 times as long as deep. Tactile seta of tarsus iv. about two-thirds (·64) of tarsal length removed from the base of segment (fig. 3 E). Genital area of female characterized by a great reduction in the number of opercular setæ; pattern as shown in figs. 3 B & F.

Measurements (mm.).—Female. Total length 1·49. Abdominal breadth ·75. Carapace ·528 long and ·570 broad (posteriorly). Palps: trochanter ·256 × ·156; femur ·392 × ·170; tibia ·385 × ·182; chela ·626 × ·248; hand without pedicel ·333 long; with pedicel ·389 long; fingers ·320 long. Leg i.: femur (dorsal length of combined subsegments) 2·61 × ·102; tibia ·181 × ·065; tarsus ·202 × ·047; leg iv: femur (greatest length of combined subsegments) ·363 × ·108; tibia ·270 × ·069; tarsus ·240 × ·054.

Remarks.—*Rhopalochernes* has heretofore been known only from the neotropical region. In Beier's key ('Das Tierreich,' lviii. p. 140 (1932) this species runs to *R. antillarum* (With). The following couplet will serve to separate these two rather closely similar forms:—

Carapace longer than broad; hand (without pedicel) distinctly longer than fingers (1·3 times); antero-distal margin of tibia distinctly concave; fore tibia slightly longer than tarsus .... *antillarum* (With).
Carapace slightly broader than long; hand only very slightly longer than fingers (1·04 times); antero-distal margin of tibia nearly straight, slightly convex; fore tibia slightly but distinctly shorter than tarsus .... *navigator*, sp. n.

Subfamily *Lamprochernetinæ* Beier.

Haplochernes Beier.

1932. *Haplochernes* Beier, 'Das Tierreich,' lviii. p. 108.
1933. *Haplochernes* Beier, Zool. Jahrb., Abt. System, Okol. u. Geogr. Tiere, lxiv. p. 513.

Remarks.—Although the pleural membrane of the abdomen of representatives of this genus is smoothly reticulate rather than truly striate and the pseudotactile setæ of the fourth tibia are only very weakly differentiated (fig. 4 J), I have no hesitancy in transferring this genus from the Chernetinæ, where it was originally placed by Beier, to the subfamily Lamprochernetinæ, to which it clearly shows its affinities in the pattern of the male and female genitalia. The following key will serve to separate those representatives of the genus so far known from the area here considered. Other representatives of the genus occur in the oriental and Australian regions as well as in Madagascar and Japan :—

1. Galea with 10 branches; large species; femur about ·87 mm. long; fingers of chela with about 12 paradental accessory teeth; palps granular .... *atrimanus* (Kastner). [Samoa.
   Galea with five or six branches; smaller species; femur ·50–·75 mm. long; with 6–8 or fewer paradental accessory teeth; palps weakly granular or almost smooth (at most the anterior face of femur and tibia weakly granular) .... 2.
2. Hand 1·5–1·6 times as long as fingers; setæ ISB and IST farther apart than ST and SB .... *buxtoni* (Kästner). [Samoa.
   Hand 1·04–1·2 times as long as fingers; setæ ISB and IST about as far apart as ST and SB .... 3.
3. Both fixed and movable fingers with 5–7 paradental accessory teeth on distal half of fingers; venom duct not medianly swollen; setæ B and SB about 1 areolar diameter apart; larger species, chela of female 1·15–1·34 mm. long; with 60–70 marginal teeth on fingers of chela ...... *funafutensis* (With).
   Mobile finger of chela with accessory teeth completely lacking; fixed finger with two distal and one subdistal accessory teeth exteriorly; venom duct with a conspicuous median swelling (fig. 2 B); setæ B and SB separated by two areolar diameters; smaller species, female chela 1·06 mm. long; with 51–53 marginal teeth on fingers of chela .... *ellenæ*, sp. n.

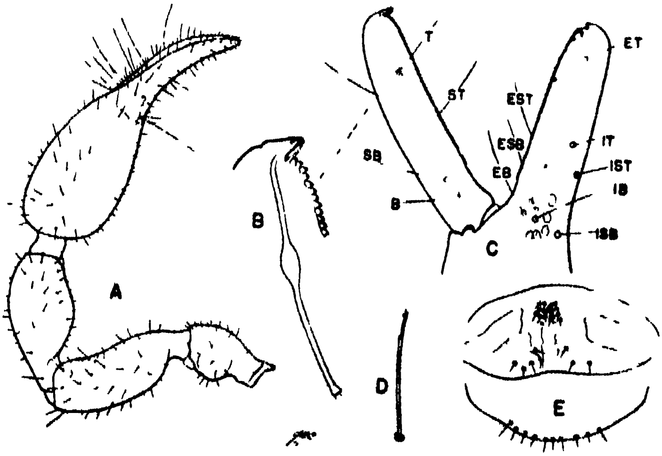
Haplochernes ellenæ, sp. n.

(Fig. 4.)

Holotype. Female (JC.235.01001). Viti Levu, Colo-i-Suva, Fiji. Collected by E. H. Bryan, June 21, 1924. Author's collection.

Diagnosis (based on female only).—Facies extremely similar to that of *H. funafutensis* (With). Carapace, tergites, and palps smooth and polished except for inner face of femur, which is distinctly but weakly granulate. Vestitural setæ superficially long and pointed, actually minutely denticulate (fig. 4 D). Eye-spots distinct. Carapace distinctly longer than broad (1·24 times); both furrows distinct, anterior furrow distad of median, posterior furrow nearer posterior carapacal margin than anterior furrow; carapace 2·2 times as long as distance from anterior carapacal margin to anterior furrow. Tergites 1–3 narrowed and entire, 4–10 obscurely divided by a linear stripe or impression; scuta weakly sclerotic, but not merging into intersclerotic and pleural membranes; tergites 1–3 uniseriate, bordered by ten setæ; tergites 4–10 biseriate, with four discal and 10–15 marginal setæ. Pleural membrane smoothly reticuloplicate; sternites similar to tergites, biseriate and with four discal and 15–18 marginal setæ. Segment 10 with three pairs of dorsal and two pairs of ventral, discal, semitactile setæ; segment 11 with two pairs of pseudotactile setæ dorsally and ventrally. Galea of same general appearance as in *H. funafutensis* (With), but with only five branches (in the holotype and only known specimen); serrula exterior

Fig. 4.



Haplochernes ellenæ, sp. n (female, holotype).

A. Dorsal aspect of left palp. B. Tip of movable finger of chela showing inflated venom duct. C. Interior aspect of right chela. D Vestitural seta from inner face of palpal tibia. E. Genital area of female.

with 19 ligulate teeth; lamina interior with three dentate subapical lobes; setæ *sb* and *b* of chelicera terminally denticulate (character of *es* indeterminable). Palps (fig. 4 A) very similar to those of *H. funafutensis* (With); trochanter with a distinct dorsal protuberance and about 1·8 times as long as broad; femur 1·53 times as long as trochanter, ·95 as long as tibia, and 2·57 times as long as broad; tibia 2·3 times as long as broad; chela 3·19 times as long as broad; hand slightly but distinctly broader than deep (1·04 times), and slightly but distinctly longer than fingers (1·07 times). Chætotaxy and dentition of chela as shown in fig. 4 C; movable finger with 51–53, fixed finger with 53 marginal teeth; accessory teeth reduced in number, movable finger with none; fixed finger interiorly with one apical tooth, exteriorly with two distal teeth and one submedian accessory tooth (fig. 4 C); nodus ramosus about three areolar diameters distad of seta ST; duct of venom apparatus with a distinct ovate swelling or enlargement distad of seta T (figs. 4 B & C); setæ B and SB separated at least two areolar diameters; setæ IST and EST distinctly nearer to seta IT than to ESB; with a pseudotactile seta on movable finger between T and ST and scarcely distad of nodus ramosus; no terminal or subterminal pseudotactile seta noted (may be broken and lost from only available specimen). Sense-spots on both fingers, two or three interiorly near base of movable finger, about 6 interiorly and basally to subbasally on fixed finger and at least one basally to subbasally on fixed finger (fig. 4 C). Sense-spots in only available specimen not uniform in size. Leg i.: femur (dorsal length of both subsegments) 1·36 times as long as tibia and 2·9 times as long as deep; tibia with a subterminal sense dome, 1·04 times as long as tarsus and 3·09 times as long as deep; tarsus 4·0 times as long as deep. Leg iv.: femur (greatest length of both subsegments) 1·44 times as long as tibia and 3·0 times as long as deep; tibia with a short, submedian, denticulate pseudotactile seta, 1·26 times as long as tarsus and 3·35 times as long as deep; tarsus 1·2 times as long as fore tarsus and 4·0 times as long as deep. Fourth tarsus with a subbasal sense dome and a slender and completely acuminate pseudotactile seta which is placed .32 of tarsal length from its base. Female genital area of typical lamprochernetine type, nearly or quite the same as in *H. funafutensis* (With) (fig. 4 E).

Measurements (mm.).—Female, holotype. Total length 2·80; abdominal breadth 1·21. Carapace ·76 long and about ·61 broad posteriorly. Palps: trochanter ·359 × ·195; femur ·548 × ·213; tibia ·576 × ·248; chela 1·061 × ·333 broad and ·320 deep; hand ·574 long; fingers ·538 long. Leg i.: femur (dorsal length of combined subsegments) ·378 × ·129; tibia ·278 × ·090; tarsus ·266 × ·066. Leg iv.: femur (greatest length of combined subsegments) ·589 × ·195; tibia ·408 × ·122; tarsus ·324 × ·081.

Remarks.—This species is apparently rather close to *H. funafutensis* (With), but differs distinctly in certain important respects. See the generic discussion for an itemization of the more important points of difference.

The holotype carried a flat circular disc of eight developing embryos. The entire disc measured ·39–·42 mm. in diameter.

LAMPROCHERNES Töm.

References.—For literature citations concerning this genus see Beier, 'Das Tierreich,' lviii. p. 82 (1932).

Remarks.—The occurrence of at least two species of this otherwise holarctic genus in the islands of the South Pacific is of more than ordinary interest although not unique, being paralleled, for example, by the distribution of the genera *Solinus* and *Sternophorus*, both of which have North American and Australian representatives. It is possible, of course, that later study may reveal characteristics sufficiently distinct to permit the segregation of these two species from Lamprochernes, but such is impossible at this time.

The two species here described may be separated by means of the following key:—

1. Large species, male, 3·7 mm. long (femur, ·867 mm. long); fingers much shorter than hand, which is as long as tibia; fingers scarcely longer than breadth of hand; fixed finger with 37, movable finger with 48 marginal teeth; seta EST and IST nearly opposite; fourth pedal femur 2·3–2·5 times as long as deep; with 10–14 evenly spaced accessory teeth exteriorly on each finger .... *samoanus*, sp. n,

Small species, male, 1·68 mm. long (femur, ·42–·44 mm. long); fingers and hand subequal in length; fingers much longer than breadth of hand; tibia much longer than hand; fixed and movable fingers with 26–27 marginal teeth; seta EST distinctly anterior to IST; fourth pedal femur 3·06 times as long as deep; exteriorly with only two or three accessory teeth on each finger .... *kanaka* Chamberlin.

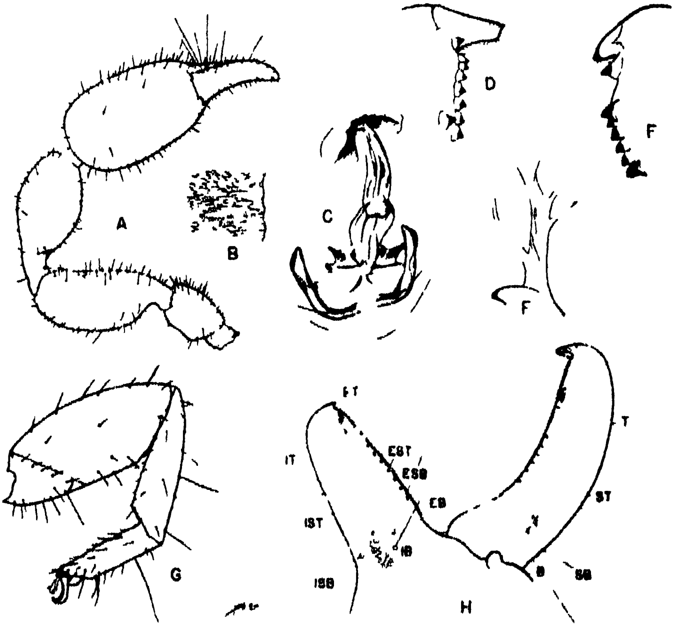
Lamprochernes samoanus, sp. n.

(Fig. 5.)

Holotype. Female (JC. 233.01001), Salailua, Savaii, Samoa. Collected by E. H. Bryan, May 22, 1924. Author's collection.

Diagnosis.—Carapace distinctly broader than long (1·2 times); anterior groove prominent and nearly median; posterior groove obscure and nearly median between anterior groove and posterior margin of carapace. Eyes absent; eye-spots obscure or absent. Carapace, tergites, and palps smooth and glossy except for a few inconspicuous and rounded granules on inner profile of palpal femur and distinct granulations interiorly at base of fingers. All tergites and sternites except 1, 2, and 11 divided more or less clearly by a nearly linear suture (very obscure on anterior tergites); tergites 2 and 3 markedly narrowed; tergal chætotaxy of an imperfect biseriate type medianly with about four discal and ten marginal setæ, posteriorly with four to six discal and twelve to fourteen marginal setæ. Sternal chætotaxy similar but with four discal and sixteen to eighteen marginal setæ. Tergites with prominent lateral maculæ or spots occupying nearly the full outer half of each scuta; similar but less prominent spots on sternites. Scuta sharply rectangular, medianly only about 1·4 broader than long. Pseudotactile setæ developed on tenth and eleventh abdominal segments. Pleural membrane reticulostriate (fig. 5 B). Vestitural setæ long and slender and only very minutely denticulate. Setæ *esb*, *eb*, and *es* of chelicera denticulate; lamina interior with three dentate subapical lobes; serrula exterior with nineteen ligulate teeth; galea prominent (fig. 5 F) with nine simple, slightly curved branches, the interior basal branch simple, but nearly twice as long as the others. Palps robust (fig. 5 A); trochanter with a prominent and rather slender cone-like protuberance, 1·8–1·9 times as long as broad and about 1·5 times as long as deep, femur robust, gently concave anteriorly and strongly convex posteriorly, slightly shorter than tibia, 1·6 times as long as trochanter and 2·2–2·3 times as long as broad, tibia slightly but distinctly shorter than carapace, 2·2 times as long as broad, chela very robust, fingers only slightly longer than breadth and shorter than depth of hand; chela 2·6 times as long as broad and 1·6 times as long as tibia; fingers much shorter than hand, which is subequal to the tibia in length; fixed finger with about 37, movable finger with about 47 marginal teeth, the basal ones mostly

Fig 5



Lamprochernes samoanus, sp n (male, holotype)

A Ventral aspect of right palp B Reticulo-striate pleural membrane of abdomen. C. Sketch of male genitalia (cleared). D. Tip of movable finger of chela showing venedens and lamina defensor E. Tip of fixed finger of chela showing receptor venedens and lamina defensor of functionless venedens F. Galea G Lateral aspect of leg iv. H Intero-lateral aspect of left chela.

obsolete; movable finger interiorly with a contiguous pair of accessory teeth opposite the tenth to twelfth marginal teeth, and a series of fourteen evenly spaced accessory teeth exteriorly which extend nearly the full length of the dental margin (figs. 5 D & H); fixed finger with a similar series of eleven or twelve accessory teeth exteriorly and three subapical accessory teeth interiorly (figs. 5 E & H); chætotaxy of chela as illustrated (fig. 5 H); setæ SB and B nearly contiguous, scarcely an areolar diameter apart; seta ST nearer SB and B than T; nodus ramosus opposite twenty-second marginal tooth and caudad of T; seta ET nearly terminal, opposite sixth and seventh marginal teeth; IT distad of median and much distad of EST; EST and IST about opposite each other; ISB, IB, ESB, and EB proximad of basal marginal teeth; a submedian pseudotactile seta occurring on each finger (no distal one was noted on the movable finger, but it may have been broken off). Dense cluster of about sixteen sense-spots interiorly between ISB and IB together with a cluster of about four spots slightly proximad of IST and EST, about five sense-spots interiorly on movable finger opposite and distad of SB and B; fixed finger with two or three subbasal sense-spots exteriorly. Leg i.: femur (both segments) slightly longer than breadth of chela, 1·37–1·38 times as long as tibia, and 2·5–2·7 times as long as deep; tibia 1·16–1·18 times as long as tarsus and 3·0 times as long as deep; tarsus 3·7–3·8 times as long as deep; leg iv. (fig. 4 G); femur (greatest length of both subsegments) 1·32–1·36 times as long as tibia and 2·3–2·5 times as long as deep; tibia as long as depth of chela, 1·42–1·43 times as long as tarsus, and 3·3–3·7 times as long as deep; tarsus 3·7–3·8 times as long as deep. Male genitalia of characteristic lamprochernetine type, about as shown in accompanying sketch (fig. 5 C).

Measurements (mm.).—Holotype. Total length 3·7. Abdominal breadth, 1·1. Carapace ·94 × ·79. Palps: trochanter ·545 × ·294; femur ·867 × ·381; tibia ·900 × ·410; chela 1·461 × ·560 broad and ·645 deep; hand ·915 long; fingers ·587 long. Leg. i: femur (dorsal length of both subsegments) ·588 × ·221–·232; tibia ·430–·426 × ·144–·143; tarsus ·372–·361 × ·099. Leg iv.: femur (greatest length of both subsegments) ·885–·869 ×

·356–·377; tibia ·652–·656 × ·174–·202; tarsus ·459 × ·459 × ·120–·125.

In the foregoing pedal measurements both legs were measured; where these differ, the measurement for the left leg is given first and separated from the homologous measurement of the right leg by a dash.

Remarks.—This species is quite different from *L. kanaka* Chamberlin, as has already been pointed out, although in palpal proportions the two species are nearly identical.

Family **Cheliferidæ** Hagen.

Subfamily *CHELIFERINÆ* Simon.

Tribe LOPHOCHERNETINI Chamberlin.

Lophochernes bifissus (Simon).

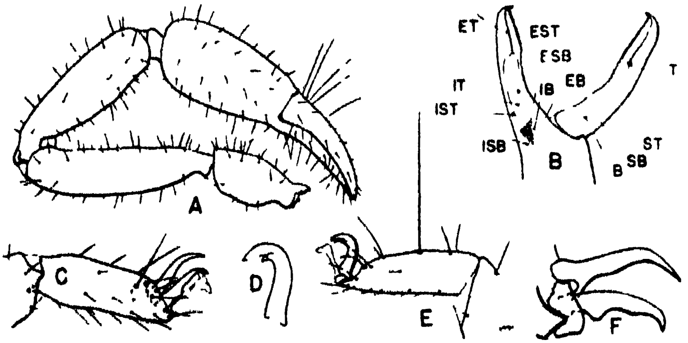
(Fig. 6.)

1899. *Chelifer bifissus* Simon, Ann. Soc. Ent. Belg. xliii. p. 121.
1931. *Chelifer bifissus* Simon, Chamberlin, Stanford Univ. Pub. Univ. Ser. Biol. Sci. vii. figs. 10, I; 42, S; and 46, M.
1932. *Lophochernes bifissus* (Simon), Beier, 'Das Tierreich' lviii. p. 246.

Material examined.—Male (JC. 220.01001), labelled "*Chelifer bifissus* Simon. Sumatra." Exchange through L. Fage of the Paris Museum. Probably part of Simon's original material.

Diagnosis.—(Addenda. All the following observations are from the above specimen.) Contrary to Beier's statement, the tergites are all undivided, although, instead of the usual divisional suture, the sclerotization and pigmentation are lighter than usual, giving the impression of a line of division. Carapace tessellate but smooth—(not at all granulate). Tergites 1–6 with tergal crests. Sternites 4–10 showing obscure partial to nearly complete division. Setæ *sb*, *b*, and *es* of chelicera at least minutely denticulate; serrula exterior with sixteen teeth. Anterior blade of flagellum almost simple (a single small lateral denticle occurs). Fore claws asymmetrical, but untoothed (figs. 6 C & F) (see also Chamberlin, *l. c.* fig. 42, S). Coxal sacs with only six or seven internal "setæ," which are separated into a lateral and a distal group of three or four each (Chamberlin, *l. c.* fig. 46, M). Pseudotactile setæ of tarsus iv. superficially median, actually ·41 of tarsal length from its base (fig. 6 E). Palps (fig. 6 A) smooth and polished. Trochanter 2·21 times as long as broad ; femur slightly longer than carapace and 3·98 times as long as broad ; tibia slightly shorter than femur and 3·32 times as long as broad ; chela 3·42 times as long as broad ; hand broader than deep (1·2 times) and longer than fingers (1·18 times) ; chela (fig. 6 B) distinctly gaping ; marginal teeth of fixed finger numbering 21 or 22, of movable finger 25 or 26 ; on both fingers the basal four or five teeth that lie within the concavity producing the gape being reduced and more or less separated ; all tactile setæ of the interior series of the fixed finger lying proximad of EST, which, in turn, is distinctly proximad of median ; IST laterad of, and about one areolar diameter proximad of, IT, which is opposite and about 1–½ areolar diameters proximad of EST ; SB and B an areolar diameter apart ; T anterad of median ; ST closer to B–SB than to T ; sense spots occurring interiorly on fixed finger and exteriorly on both fingers ; a cluster of 10–12 occurring between ISB and IB ; two distad of ESB and two or three between B, SB, and ST. Leg i. : femur (dorsal length of both subsegments) 1·5 times as long as tibia and 3·06 times as long as deep ; tibia subequal in length to breadth of chela and 2·54 times as long as deep ; tarsus as long as depth of chela and 2·8 times as long as deep. Leg iv, : femur (greatest length of

Fig. 6.



Lophochernes bifissus (Simon) (male, JC. 220 01001).

A. Ventral aspect of right palp. B. Intero-lateral aspect of left chela. C. Tarsus i. showing secondary sexual modifications. D Tarsal claw from leg iv. E. Lateral aspect of tarsus iv. F. Sexually modified tarsal claws of leg i.

combined subsegments) as long as hand of chela and 3·1 times as long as deep; tibia 3·33 times as long as deep and 1·44 times as long as tarsus; tarsus scarcely longer than fore tarsus and 3·62 times as long as deep.

Measurements (mm.).—Total length (KOH-cleared) 1·67. Abdominal breadth, ·72. Carapace ·557 long, ·473 broad posteriorly, and ·279 broad across eyes. Anterior margin of carapace to anterior furrow, ·265, anterior to posterior furrow, ·202, posterior furrow to posterior margin ·091. Tergal lengths: first, ·074; second ·084; third ·077; fourth ·098; fifth ·118; sixth ·139. Palps: trochanter, ·338 × ·153; femur ·576 × ·145; tibia ·568 × ·171, chela ·810 × ·237 long and ·195 deep; hand ·460 long; fingers ·390 long. Leg i.: femur (dorsal length of both subsegments) ·346 × ·113; tibia ·230 × ·091; tarsus ·195 × ·070. Leg iv.: femur (greatest length of both subsegments) ·461 × ·149; tibia ·292 × ·088; tarsus ·202 × ·056.

Remarks.—Beier (*l. c.*), in his redescription of this species, does not note the source of his material, but I presume it was Sumatra, in spite of the fact that in his record of the distribution of the species he questions the Sumatran record as doubtful. This is evidently a typographical error, however, since, as previously indicated, Sumatra is the type-locality. At any rate his redescription indicates sixteen teeth in the serrula for both sexes. This agrees with my observations on the single Sumatran male specimen upon which my studies are based and disagrees with With's observations on Simon's Hawaiian specimen where twenty-five were noted. The writer has previously renamed the Hawaiian form primarily on the basis of this difference (*L. cryptus* Chamberlin, *q. v.*).

The palpal proportions herein given are definitely more slender than those given by Beier, in fact approaching those given by him for the Javan species *L. laciniosus*. The differences are insufficient, however, to justify the idea that two species might be involved.

Lophochernes cryptus Chamberlin.

1934. ***Lophochernes cryptus*** **Chamberlin, Bernice P. Bishop Museum, 'Occasional Papers,' x. (22) p. 11.**

1905. ***Chelifer bifissus*** **Simon, With. Ann. & Mag. Nat. Hist. (7) xv. p. 98. (misdetermination = *L. cryptus*, sp. n.)**

1900. ***Chelifer bifissus E.*** **Simon, 'Fauna Hawaiiensis,' v. 2, pt. 4, p. 517 (misdetermination = *L. cryptus*, sp. n.).**

Holotype. Simon's unique specimen (a female) from Olaa, Hawaii, misdetermined and recorded by him as *Chelifer bifissus* Simon (a Sumatran species) and redescribed under the same name by With (*l. c.*). Paris Museum.

Diagnosis.—See With's description cited above.

Remarks.—Although extremly close to true *L. bifissus* in palpal proportions and size, it is my belief that the two species are quite distinct. Thus *L. bifissus* (Simon) has 16-17 teeth in the serrula exterior while With records 25 blades in the serrula of *L. cryptus.* This is a large difference, considering the general constancy of this structure. No other distinct differences can be determined from With's description, and the final status of the species must remain doubtful pending restudy of the type. The differences in palpal proportions stressed by With are in reality non-existent and were evidently due to an error in Simon's original description of *L. bifissus.* The differences in the galea noted by With—*i. e.*, unbranched in the Sumatran specimens, 6-branched in the Hawaiian material—can be readily accounted for as sexual differences.

XXVII.—*The Coleopterous Genus* Anthypna (Glaphyridæ).

By Gilbert J. Arrow, British Museum (Natural History).

The genus *Anthypna* is an exceptionally well-defined one, related to the well-known and very abundant genus *Amphicoma*, but differing from it in the free, separate and, in the male, elongate lamellæ of the antennal club, the clypeus not constricted at the base, the generally narrow pronotum, and particularly in the remarkable structure of the front and middle legs of the males. In these the front tarsi, instead of the marginal comb formed of short, closely-placed bristles found in *Amphicoma*, have a corresponding but quite different comb, composed of flattened lobes projecting inwards and downwards from the four shortened basal joints. In addition, the middle tibiæ in this sex exhibit a very deep transverse incision just before the extremity, which in conjunction with the terminal spines, sometimes specially modified, forms a grappling hook of a very remarkable kind.

At the time of compiling my catalogue of the Glaphyridæ, published in 1912, this interesting genus consisted of only four known species, two of them European and two Asiatic. Eight other species from China and Tonkin were referred to *Toxocerus*, a genus characterised by Fairmaire in 1891 from *T. rothschildi*, the supposed male and female of which were apparently males of two different species. Another name, *Arrhephora*, was given by him at the same time to female specimens described as of both sexes. Discovering his mistake, he withdrew the latter name in 1899, giving a list of six species to be attributed to *Toxocerus*. One of the six names, however (*varicolor*), was an unknown name, perhaps carelessly substituted for *T. dolorosa* Fairm., which he omitted, as well as *T. riaulti*, which he had described two years previously (Leyden Museum Notes, xix. p. 243, 1897). In the last-mentioned paper the Chinese *Toxocerus rothschildi* is wrongly attributed to Kashmir.

Two Chinese species described by Semenow, also in 1891, as belonging to *Anthypna* are closely related to those named by Fairmaire, and were provisionally referred to *Toxocerus* by Reitter. All appear to have the distinctive features of *Anthypna* as given above. I therefore regard the names *Toxocerus* and *Arrhephora* as synonyms of *Anthypna*. Those who see advantage in the multiplication of generic names may perhaps discover some diagnostic feature by which the retention of one or both these names for some of the species may be rendered possible. Such attempts seem to me, however, to be only resisting an inevitable process. As more and more species of any group become known, previously apparent gaps in the series necessarily become filled, and the disappearance of many genera is as natural as their erection at an earlier date, when the known species were few.

As to the use of names for subgenera I have more than once expressed the opinion that these are unnecessary and undesirable.

Females of *Anthypna* are much less numerous than the males, which occur in considerable numbers. The males of the two European forms (*A. abdominalis* and *carceli*) have the lamellæ of the antennal club rather less elongate than most (but not all) of the Asiatic species. In the latter, however, the different species differ enormously in this respect. The elytra of the males are narrower than those of the females, and in certain species the latter have a conspicuous dilatation of the outer margin behind the middle, exactly as in the genus *Cyclocephala* and some Ruteline genera.

The peculiar habits and very remarkable larva and pupa of the type-species of the genus were described at length by Schreiber in 1870 (Berl. Ent. Zeits. xiv. p. 1, pl. 1).

The type-species (*T. rothschildi*) of Fairmaire's unfortunate genus *Toxocerus* is an insect of which I have been able to examine a good series of specimens collected by Mr. C. N. Pope in 1927 at San Chiang, Foochow. I have been enabled to identify it from a specimen compared with the type, which has been kindly lent to me by Dr. Boschma of the Leyden Museum. I had previously considered it to be undescribed, for Fairmaire's statement that the antennal club of the male is "longer than the funicle" did not suggest to me that this part is of enormous length and actually at least six times the length of the extremely short funicle. The colour of the upper surface may be fiery crimson, coppery, golden green, bright blue, violet, or black. The only two females I have seen are black, the antennal club is broadly oval, almost round, the pronotum is much broader and much less closely punctured than that of the male, and the elytra are very broad behind the middle and taper to the end.

Both sexes are rather sparingly clothed with short setæ, the abdomen is covered with longer close-lying hairs and the breast with very long, loose hairs.

The male is peculiar in its very close and strong puncturation, and the form of the antenna with flabellum as long as the head and thorax together. The front tibia is rather slender and bears three well-marked teeth and the front claws have each a strong rounded lobe at the base. The middle tibia is also slender and the terminal hook, although of the usual form, is rather smaller than usual. The prothorax is distinctly widened, although not angulate a little before the middle and contracted in front and behind, with the base fairly wide, almost straight and very feebly excised in the middle. The scutellum is long and narrow and the elytra have straight parallel sides.

Including the three new species which are described in the following pages, the total number of known species of *Anthypna* now amounts to sixteen, inhabiting Southern Europe, Western and Southern China, Japan, Indochina, and Burma. The number will probably be considerably increased when this enormous area of distribution has been further investigated.

List of Species of the Genus Anthypna.

abdominalis F., 1781. Italy, etc.
birmanica, sp. n. Burma.
carceli Cast., 1832. Italy, etc.
chalcochrysea Fairm., 1891. Central China.
corinthia Fairm., 1891. China, Tonkin.
davidis Fairm., 1886. W. China.
dolorosa Fairm., 1891. China.
dubia Sem., 1891. China.
fairmairei Sem., 1891. China.
florentini Fairm., 1893. Tonkin.
jucunda, sp. n. Tonkin.
latouchei Fairm., 1900. S. China.
pectinata Lewis, 1895. Japan.
regalis, sp. n. Tonkin.
riaulti Fairm., 1897. W. China.
rothschildi Fairm., 1891. S. China.

Anthypna jucunda, sp. n.

Læte viridis vel viridi-aurea, elytris plus minusve violaceis, abdomine flavido, antennis, pedibusque (femoribus exceptis) rufis vel rufopiceis, corpore toto (elytris autem marginibus exceptis sparse et minute) griseo-hirto; corpore nitido, parum elongato, capite grosse, pronoto minute parum dense, elytrisque equaliter modice crebre punctatis, pronoto transverso, antice angustato, lateribus antice fere rectis, postice arcuatis, paulo deplanatis, basi sat lato, leviter rotundato, medio vix emarginato, scutello lato, angulato; elytris convexis, parum longis, apicibus rotundatis; pedibus gracilibus:

♂, tibia antica bidentata, antennarum flabello quam stipitem multo longiori;

♀, tibia antica tridentata.

Long. 9–10 mm.; lat. max. 4–5 mm.

TONKIN: Chapa (*Jeanvoine*). LAOS: Pak-lay (*R. Vitalis de Salvaza*).

A. jucunda is similar in size and shape to *A. pectinata* Lewis, from Japan, but in its bright shining surface and brilliant colouring it resembles the Chinese *A. latouchei*

Fairm. As in the latter the head, prothorax, scutellum, sternum, and femora are bright metallic green and the elytra intense blue, sometimes green in parts. The abdomen, as usual, is light red and the tibiæ, tarsi, and antennæ are deep red. The entire surface is clothed with pale hair, which is very short and inconspicuous upon the elytra. The pronotum is distinctly transverse and scarcely narrower than the elytra at the shoulders, the sides strongly rounded, narrowly contracted in front and less contracted behind, with obtuse hind angles. The elytra are rather narrow and parallel-sided, a little narrower and slightly divergent at the extremities.

The female is relatively shorter, with the elytra rounded at the sides and broader behind. The male has the club of the antenna longer than the pronotum and nearly twice as long as the scape and funicle together. Joints 5, 6, and 7 of the latter are extremely short and the leaflets of the club are narrow, with the ends dilated and spatulate. The clypeus is narrower than that of the female and the eyes, which are completely divided in both sexes, are closer together.

Anthypna regalis, sp. n.

Igneo-rufa vel læte cuprea, elytris vel cyaneis vel rufis vel cyaneis dimidio antico rufo, sterno viridi-metallico, abdomine griseo, clava antennali pedibusque fuscis ; corpore toto sat dense et longe fulvo-hirsuto, pilis dorsalibus erectis, abdominalibus decumbentibus ; elongata, supra undique crebre punctata, nitida, clypeo longo, truncato, pronoto angusto, rotundato, angulis posticis nullis, anticis fere rectis, scutello longo, angusto ; elytris crebre vix dense punctatis, nitidis ; pedibus gracilibus, tibiis anticis tridentatis :

♂, antennarum flabello longitudine ad stipitem æquali, elytris postice leviter angustatis ;

♀, elytris latioribus, post medium abrupte angulatis et angustatis.

TONKIN : Chapa (*Jeanvoine*, May, June). Mauson Mts., 6000–9000 ft. (*H Fruhstorfer*, April, May, Leyden Museum). Tam Dao (*H. Perrot*).

This beautiful species resembles the Chinese *A. chalcochrysea* Fairm., described from the female, but is more elongate and more finely punctured. The Tonkin insect is remarkable for the variable coloration of its elytra. The head and pronotum are of a vivid golden or fiery red and the elytra intense blue, violet, bright red with a purple infusion, or red on the anterior and blue on the posterior half. The whole body is clothed with tawny hair, erect upon the upper surface and rather short, but mixed with long hairs, upon the hinder part of the elytra. The scutellum is long and narrow, as in *A. rothschildi*, and the elytra are broad relatively to the prothorax and meet almost to the apex, not gaping widely behind, as in *A. jucunda*. In the female they are very broad, but taper abruptly and rapidly from two-thirds of their length. The front tibia is tridentate.

Anthypna birmanica, sp. n.

Viridi-ænea, elytris nigris, purpureo-nigris vel brunneis, antennis pedibusque nigris, corpore toto parum dense aut longe griseo-vestito; elongata, angusta, pedibus gracilibus, capite punctato-rugoso, clypeo quadrato; pronoto leviter transverso, minute sat crebre punctato, convexo, angulis anticis acutis, lateribus medio angulatis, postice deplanatis, angulis posticis obtusis, basi fere recto, scutello parvo, fere semicirculari, parce punctulato; elytris minute crebre punctatis (♀) vel denso punctatorugosis (♂), apicibus dehiscentibus:

♂, antennarum flabello longitudine ad stipitem fere æquali, tibiis anticis bidentatis, elytris fere opacis, postice angustatis;

♀, elytris subnitidis, postice parum angustatis, tibiis anticis tridentatis, dente tertio obtuso.

Long. 13–15 mm.; lat. max. 4·5–5 mm.

N.E. Burma: Kambaiti, 7000 ft. (*R. Malaise*, May).

This is larger and considerably more elongate than *A. jucunda*, but resembles it in the shape of the pronotum and the short blunt scutellum. The upper surface is less brilliant and the elytra are densely sculptured and rather dull, at least in the male, but the head, pronotum and scutellum are of a vivid golden-green colour and sometimes fiery red. The two sexes differ comparatively little in their superficial appearance, but the female is less closely sculptured and more shining than the male. The elytra are shorter and less tapered behind, without a lateral angulation as in those of *A. regalis*. The middle and hind tarsi are extremely long and slender, especially in the male, and the terminal hook of the middle tibia of the latter is not very large. The club of the antenna of the male is scarcely as long as the footstalk.

XXVIII.—*A Revision of the Fishes referred to the Genus* Canobius *from Lower Carboniferous Localities other than Glencartholm.* By J. A. MOY-THOMAS, M.A., Department of Zoology and Comparative Anatomy, Oxford.

INTRODUCTION.

The species of the genus *Canobius* from Glencartholm, Eskdale, Dumfriesshire, have been shown by Moy-Thomas and Bradley Dyne (1938) to belong to two distinct genera. Traquair had already suggested this possibilty, and in 1890 divided them into two genera, *Canobius* and *Mesopoma*. However, in 1912 he again included all the species in the genus *Canobius*, being unable to find a sufficiently satisfactory criterion of distinction. These two genera can now be defined as follows :—

Genus CANOBIUS, Traquair.

Body fusiform ; dorsal and anal fins far back, triangular, short-based, nearly opposite one another and of much the same size ; tail heterocercal, very inequilobate, but not very deeply cleft, the axial lobe not making a very sharp angle with the body ; pectoral fins with lepidotrichia unjointed for most of their length ; head relatively short, rounded anteriorly ; orbit large ; suspensorium nearly upright ; opercular smaller than subopercular ; gulars few in number ; expanded portion of the maxillary rounded ; ornament of head-bones fine anastomosing striæ ; teeth variable in size ; scales rhomboidal, their posterior margins denticulated or entire.

Genus MESOPOMA, Traquair.

Body fusiform ; dorsal and anal fins fairly far back, triangular, short-based, nearly opposite one another, the former slightly the smaller ; the tail heterocercal, inequilobate, deeply cleft, the axial lobe making a sharp angle with the body ; the pectoral fins with principle rays unjointed for most of their length ; the head rather short without a prominent rostrum ; orbit large ; suspensorium not very oblique ; opercular the same size or larger than sub-opercular ; gulars not very numerous ;

the expanded portion of the maxillary sometimes rounded but usually shaped as in typical Palæoniscoids; ornament of head-bones tubercles or striæ; teeth rather small and conical, extending the entire length of the maxillary; scales rhomboidal, their posterior margins denticulated or entire.

There are two species of the genus *Canobius* from Glencartholm, *C. ramsayi* and *C. elegantulus*, and three of the genus *Mesopoma*, *M. pulchellum*, *M. politum*, and *M.* (?) *crassum*.

During the re-description of the Glencartholm species of *Canobius* it was found necessary to examine fishes attributed to this genus from other Lower Carboniferous localities, and in this paper a brief account and revision of these is given.

1. *Canobius obscurus.*

Traquair (1881) described but did not figure specimens of this little fish from the Cementstone Group of Blackadder Water, near Duns in Berwickshire. He refers to a "few fragmentary specimens . . . . . of a fish from 2 to 2½ inches in length." This fish seems to have remained in obscurity ever since its original description, and no reference is made to it by Traquair in his monograph on Carboniferous Palæoniscids. Considerable difficulty was experienced in tracing Traquair's material, and although four specimens were eventually found in the Geological Survey collection, they cannot represent all that Traquair had, since none of them shows the head, which he described.

The scales are small and rhomboidal and ornamented "with from three to five straight flattened ridges, which pass diagonally from above downwards and backwards, and terminate in prominent denticulations of the posterior margin." Therefore, it can be seen that in general appearance the scales are very similar to those of *Ætheretmon* (White, 1927). A further resemblance to *Ætheretmon* is also found in the development of relatively large fulcra, interpolated between the ends of the lepidotrichia of both the dorsal and caudal fins. The caudal fin does not seem to have been "deeply cleft," as Traquair described it, but to have been more the shape of that of *Ætheretmon*. There was a row of rather small ridge-scales along the dorsal surface between the dorsal fin and the head as in *Ætheretmon*, but the ventral surface is never well enough preserved to state definitely whether ridge-scales also occur on it.

Traquair's description of the head in some respects differs from that of *Ætheretmon*. The ornament of the bones seems to have been much the same in both fishes, but the "vertical or at least only slightly oblique suspensorium" (incidentally the only character described by Traquair that resembles *Canobius*) is strikingly dissimilar to that of *Ætheretmon*. It must, however, be remembered that Traquair described the suspensorium of "*Canobius*" *politus* as "only very slightly oblique," whereas it is not actually a great deal less oblique than that of *Ætheretmon*, and it is probable that he was also mistaken in this case.

Canobius obscurus is, therefore, in the present state of our knowledge indefinable, but in the opinion of the writer it is certainly a species of *Ætheretmon* and not of *Canobius*. It is, however, impossible to be absolutely sure of this in the absence of better material.

2. *Canobius modulus*.

This little fish, from the Albert Shales of New Brunswick, was originally described as *Palæoniscus modulus* by Dawson (1877); it was referred to *Palæoniscus* by Newbury (1889), to *Rhadinichthys* by Smith Woodward (1891) and Eastman (1908), but to *Canobius* by Lambe (1910). The type-specimens have recently been re-examined by Dr. T. S. Westoll, who tells the author that it is really a peculiarly preserved specimen of *Rhadinichthys alberti*. The author is grateful to Dr. Westoll for permission to publish this observation.

3. *Canobius ramsayi*.

One or two specimens have been referred to this species by Miller (1887) from the Cementstones of Coomsdon Burn, near Redewater, Northumberland. The specimens, which were collected by John Rhodes, are undoubtedly not *Canobius ramsayi*, but belong to a new species of *Strepheoschema* with a very oblique jaw suspension. This fish has been described by the author (Moy-Thomas, 1938) in a work on the fishes of this locality, which are in many ways similar to those of Foulden (White, 1927).

4. *Canobius macrocephalus.*

Traquair (1890 *a*) described this little fish from the Lower Carboniferous "Curly" shale at Pumperston, and Roman Camp in the Broxburn District, West Lothian, as *Rhadinichthys macrocephalus*. Later (1890 *b*) he referred it to *Mesopoma*, but Smith Woodward (1891) and Traquair (1912) placed it in the genus *Canobius*. The material of this fish has been re-examined, and there is no doubt that it is a species of *Mesopoma*, closely related to *M. politum* from Glencartholm. The author has considered it worth while to supply the following new description of this form.

Mesopoma macrocephalum, (Traquair).

Rhadinichthys macrocephalus, Traquair, 1890 *a*.
Mesopoma macrocephalum, Traquair, 1890 *b*.
Canobius macrocephalus, Smith Woodward, 1891.
Canobius macrocephalus, Traquair, 1912.

Type: 1901–227–2 in the Royal Scottish Museum.

Specific Diagnosis.—Fishes not exceeding 11 cm. in length, the length of the head contained rather more than four times and the greatest body depth about four times in the total body length. The expanded part of the maxillary smaller but similar in shape to that of typical Palæoniscids, no sub-orbitals and seven gulars, opercular larger than sub-opercular; the scales smooth or only slightly ornamented with numerous small denticulations posteriorly; a few ridge-scales in front of the dorsal fin; the ornament of the head-bones distinctive.

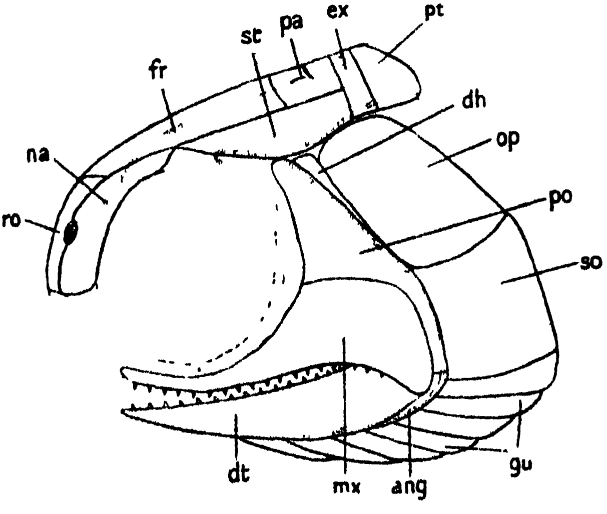
Description.

The skull.—The arrangement and shape of the dermal bones of the skull and sensory canals, as far as can be determined, are shown in fig. 1. The most characteristic features are the shape of the maxillary and absence of sub-orbitals.

The ornament of the parietals, frontals, supra-temporals, post-rostral, nasals, extra-scapulars, post-temporals, and gulars consists of ridges which are occasionally interrupted and anastomose, but tend to run parallel with the long axes of the bones. The maxillary is ornamented with similar ridges on its anterior part, but the expanded portion is largely smooth save for a few ridges ventrally and posteriorly running parallel with these margins. The ornament of the dentary is of ridges radiating from the posterior end, ventrally more or less parallel with the long axis, and dorsally cutting the upper margin at an oblique angle. The opercular, sub-opercular and pre-opercular are smooth, but the opercular may have a few longitudinal striæ dorsally. The teeth are small and conical.

The paired fins and their girdles.—All the bones of the pectoral girdle are ornamented with striæ. The pectoral fin is formed of about a dozen rays, the more anterior of which are not jointed till towards their terminations.

Fig. 1.



Mesopoma macrocephalum (Traq.) Restoration of head.

All the fins have well-developed fulcral scales. The pelvic fin is rather small, consisting of only about eight much-jointed lepidotrichia.

The unpaired fins.—The dorsal fin is smaller than the anal and consists of about twenty lepidotrichia, whereas the latter consists of about twenty-five; all are much jointed. The caudal fin is heterocercal, inequilobate and deeply cleft. The fifth or sixth ray is the longest in all the unpaired fins.

The squamation.—The scales are mainly smooth, but may have a few antero-posterior striæ, their posterior borders being broken up into numerous small denticulations. There are three small ridge-scales in front of the dorsal and anal fins, and those on the axial lobe of the tail start directly behind the dorsal fin.

Remarks.—This species resembles *M. politum* very closely in the shape and arrangement of the dermal bones of the skull and in the proportions of the body and squamation. However, it is easily distinguished by the ornament of the roofing bones, which consists of ridges and not tubercles, and the scales, which have smaller denticulations posteriorly.

5. *Canobius* cf. *politus.*

White (1937) referred a very fragmentary specimen from the "Crangopsis Bed" at Ardross Castle, Fifeshire, to this species. During the summer of 1937, however, the author collected several new specimens of this fish from Ardross, and in the light of these specimens there is no doubt that it is a new species of *Mesopoma*, a description of which is given below.

Mesopoma ardrossense, sp. n.

Holotype : P 22,000—in the British Museum (Natural History).

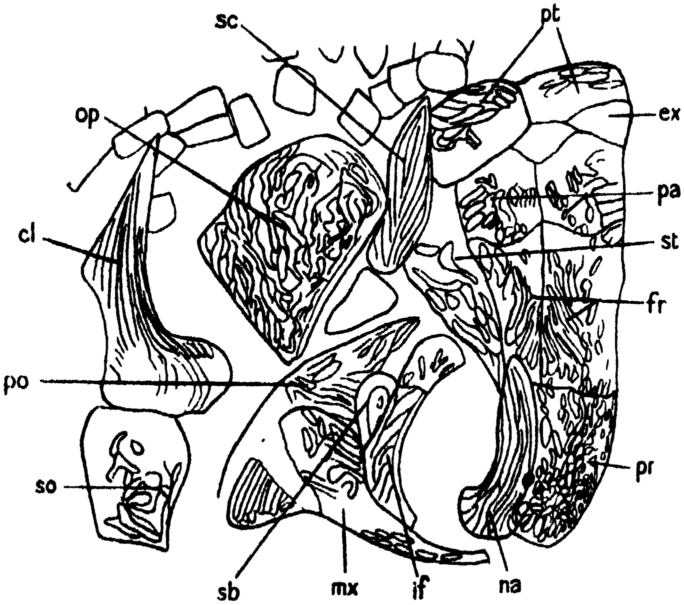
Paratypes : P 22,002–3, P 22,004, British Museum (Natural History).

Diagnosis of species.—Fishes not known to exceed 9 cm. in total length, the length of the head being contained about four-and-a-half and the greatest depth of the body about four times in the total length. The expanded part of the maxillary small but similar in shape to that of typical Palæoniscoids ; a sub-orbital, opercular larger than sub-opercular ; scales not denticulated posteriorly, smooth or with a few striæ. Ornament of the head-bones characteristic.

Description.

The skull.—The skull is best shown in the type-specimen (fig. 2). The arrangement and shape of the dermal bones of the skull are similar to those of *Mesopoma macrocephalum*, but a suborbital is present. The supratemporals, parietals, post-temporals, frontals and nasals are ornamented with short ridges running parallel with the long axes of the bones and occasionally anastomosing. The post rostral is tuberculated. The infra-orbital has a few relatively large oblique ridges, and those of the pre-opercular run more or less parallel with the long axis. The maxillary is ornamented with rather short striæ over its entire surface, and the opercular and sub-opercular with a network of similar striæ. The dentition, apart from numerous small teeth on the palato-quadrate ossifications, is not preserved.

Fig. 2.



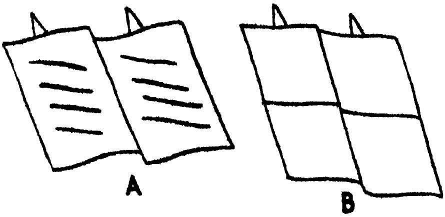
Mesopoma ardrossense, sp. n. Head of the type-specimen. P 22,000.

The paired fins and their girdles.—Of these only the pectoral fin and girdle are known. The cleithrum and supra-cleithrum (fig. 2) are striated longitudinally. The anterior rays of the pectoral fin appear to be unjointed for most of their length, and the posterior to be jointed to their bases. This fin is only preserved in P 22,002, and the state of preservation is not good enough for further description.

The unpaired fins.—The dorsal fin is never wholly preserved; its base is seen in P 22,004 lying rather far back and directly above the anal. The latter is triangular and acuminate, and the caudal fin heterocercal, inequilobate and deeply cleft. The state of preservation prevents further description of either of these fins.

The squamation.—The scales (fig. 3) are ornamented with a few oblique striæ on the anterior part of the body, but those situated more posteriorly are smooth. The scales are not denticulated posteriorly. The poor preservation of the specimen described by White led to his mistakenly saying that there were "coarse posterior denticulations."

Fig. 3.



Mesopoma ardrossense.
A, flank-scales; B, posterior body scales.

Remarks.—This species is easily distinguished from other species of *Mesopoma* by its non-denticulated scales. The shape and arrangement of the skull-bones resembles those of *M. politum* and *M. macrocephalum*, but the ornament of the opercular, sub-opercular and maxillary is characteristic.

SUMMARY.

The Palæoniscids referred by various authors to the genus *Canobius* from localities other than Glencartholm are re-discussed, and the genera *Canobius* and *Mesopoma* are defined.

"*Canobius obscurus*" (Traquair, 1881) is almost certainly a species of *Ætheretmon*.

"*Canobius modulus*" (Lambe, 1910) is synonymous with *Rhadinichthys alberti.*

"*Canobius macrocephalus*" (Traquair, 1912) is redescribed as *Mesopoma macrocephalum.*

"*Canobius ramsayi*" (Miller, 1887) is a new species of *Strepheoschema.*

"*Canobius* cf. *politus*" (White, 1937) is described as a new species of *Mesopoma*, *M. ardrossense.*

Explanation of lettering of text-figures.

ang = angular.
cl = cleithrum.
dh = dermohyal.
dt = dentary.
ex = extra-scapular.
fr = frontal.
gu = gular.
if = infra-orbital.
mx = maxillary.
na = nasal.
op = opercular.
po = pre-opercular.
pr = post-rostral.
pt = post-temporal.
sb = sub-orbital.
sc = supra-cleithrum.
so = sub-opercular.
st = supra-temporal.

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XXIX.—*Helodidæ et Malacodermes nouveaux d'Afrique* [*Coléoptères*]. Par M. Pic.

Les types des nouveautés de ce mémoire font partie des collections du British Museum et des paratypes de *Xamerpus gedyei*, *Melyris viridicolor* et *Apalochrus gedyei* sont sans la collection Pic.

Scirtes diversenotatus, sp. n. [Helodidæ].

Oblongo-elongatus, postice attenuatus, griseo pubescens, nitidus, piceus, supra testaceus et piceo notatus, elytris signaturis diversis ornatis, antennis ad basin pedibusque testaceis. Capite testaceo, postice piceo, parum punctato ; thorace testaceo, postice fascia arcuata picea ornato, illo brevi et lato, antice attenuato, minute et sparse punctato ; scutello pro majore parte piceo, distincte punctato ; elytris antice thorace latioribus, elongatis, postice valde attenuatis, antice mediocre marginatis, parum fortiter sat dense punctatis, incostatis, his lateraliter, medio excepto, apice et ad suturam testaceis, in disco piceis et in singulo signaturis luteis diversis ornatis silicet : maculis tribus anticis prope suturam, longitudinaliter dispositis, macula prebasalis discoidalis, linea interna sinuata, postice furcata, linea sinuata externa, antice obliterata.

Long. 4·5 mm.

Espèce tranchée, caractérisée par les dessins particuliers des élytres, en partié maculiformes, en partie linéolés sur le disque des élytres avec la marge latérale antérieure claire faite de 2 macules juxtaposées, la basale étant plus courte, la 2ème plus longue et plus large.

Kenya Colony : Nairobi (*Gedye*).

Xamerpus gedyei, sp. n. [Dasytidæ].

Oblongo-elongatus, subconvexus, nitidus, griseo pubescens et longe hirsutus, elytris in singulo post humeros et post medium rufo maculatis, capite antice, antennis ad basin pedibusque testaceis. Capite fortiter et sparse granuloso, nigro, labro et epistomate testaceis ; thorace brevi et lato, lateraliter subarcuato, parum fortiter et sparse punctato ; elytris latis, sat brevibus, postice attenuatis, parum fortiter non dense punctatis.

Long. 4 mm.

Voisin de *X. ambrensis* Pic, s'en distingue par la forme moins robuste, le thorax non bordé de testacé, les dessins

des élytres maculiformes avec la macule postérieure un peu éloignée de la suture.

KENYA COLONY : Nairobi (*Gedye*).

Melyris viridicolor, sp. n. [Melyridæ].

Elongatus, nitidus, supra breve griseo pubescens, viridimetallicus, membris testaceis, antennis apice nigris, palpis nigris. Capite sat brevi, dense punctato, antice impresso ; antennis brevibus, pro parte pectinatis ; thorace parum brevi, antice attenuato, lateraliter sinuate carinato, medio sulcatulo, denso punctato ; elytris thorace paulum latoribus, parum elongatis, postice attenuatis, distincte costatis, intervallis triseriatim lineato punctatis.

Long. 5–5·3 mm.

Voisin de *M. brevicollis* Champ., s'en distingue, à première vue, par la forme plus allongée avec le thorax moins court.

KENYA COLONY : Kanziko (*MacArthur*).

Apalochrus gedyei, sp. n., ♀ [Malachiidæ].

Oblongus, nitidus, griseo pubescens et longe hirsutus, nigrometallicus, elytris viridibus, capite antice flavo, membris pro parte testaceis. Capite sat robusto, parum et minute punctato, inter oculos impresso ; antennis parum crassis, apice attenuatis, articulis intermediis elongatis, his nigris, articulis 1, 2 infra et 3, 4 testaceis ; thorace brevi, sat lato, lateraliter subarcuato, postice attenuato, minute et sparse punctato ; elytris thorace valde latioribus, brevibus, postice paulo dilatatis, apice breve attenuatis, sat minute punctatis ; abdomine nigro, elytris superante ; pedibus sat gracilibus, nigris, femoribus anticis et intermediis testaceis, supra lineato nigris, tarsis pro parte rufis, pedibus posticis nigris, tibiis infra testaceis.

Long. 5·5 mm.

Par sa forme ressemble à *A. trapeziderus* Champ. et voisins, mais reconnaissable, à première vue, par sa particulière coloration de deux nuances tranchées en dessus, noire sur l'avant corps, et verdâtre sur les élytres.

KENYA COLONY : Nairobi (*Gedye*).

Mixis discoalbus, sp. n., ♀ [Malachiidæ].

Oblongo-elongatus, nitidus, sparse griseo pubescens et hirsutus, rufus, capite antice, thorace postice elytrisque in disco albis, his antice et postice nigro-violaceo notatis, pectore et pygidio

nigris, membris testaceis. Capite minute et sparse punctato, rufo, postice paulo piceo et antice albo, oculis nigris; antennis minutus; thorace brevi, sat lato, postice attenuato et explanato, minute et sparse punctato; elytris thorace paulo latioribus, sat elongatis, postice paulo dilatatis et apice breve attenuatis, lateraliter sinuate marginatis, antice depressis, parum fortiter non dense punctatis, in singulo signaturis duabus nigro-violaceis ornatis; linea infrahumeralis reducta, ad basin dilatata et postice attenuata, macula transversa postmediana discoidalis, antice subarcuata, postice sinuata; pygidio nigro, prominulo; pedibus gracilibus, tibiis posticis paulo arcuatis.

Long. 4 mm.

Voisin de *M. subinterrogationis* Pic, à dessins foncés analogues, mais distinct par la coloration pale du disque des élytres, tandis que leur pourtour est roux.

KENYA COLONY: Athi Falls (*Gedye*).

XXX.—*The Races of the Australian Frog* Hyla aurea *Lesson.* By H. W. PARKER, B.A., Department of Zoology, British Museum (Natural History).

A FROG collected at Scaddon, north of Esperance, West Australia, was recently brought to the British Museum by Mr. D. L. Serventy, formerly of the University of West Australia, who remarked that it appeared to agree well with Boulenger's description of *Hyla aurea* var. *cyclorhynchus* but that it seemed very unlike the *Hyla aurea* of the neighbourhood of Perth, of which he had seen many hundreds in the laboratory. Comparison with the type of *cyclorhynchus* confirmed the identification, but a survey of all the specimens of *Hyla aurea* in the British Museum makes it seem probable that the former ought to be recognized at least subspecifically, but more probably as a species. The material examined falls into three groups, thus:—

A. Length of the inner metatarsal tubercle contained three times in its distance from the tip of the inner toe; a continuous dorso-lateral fold from the upper eyelid to the groin; dorsum between the dorso-lateral folds almost or quite smooth. No mid-dorsal light line; a continuous light line along the dorso-lateral fold and a similar one from beneath the eye to above the shoulder.

Specimens examined.—Nowra N.S.W. (11), Noumea, New Caledonia (3).

B. Length of the inner metatarsal tubercle as in A. Dorso-lateral fold broken up into a chain of warts and not extending fully backwards to the groin; dorsum with more or less strongly developed warts, rarely quite smooth. Dorso-lateral light line less marked than in A, often broader and discontinuous; a mid-dorsal light stripe almost always indicated.

Specimens examined.—Tasmania (14), Melbourne (2), Yarra River (1), " West Australia " (10), King George's Sound (2), King River, W.A. (2), Swan River, W.A. (5), Port Essington (7), " Australia " (3).

C. Length of the inner metatarsal tubercle contained 2·0 to 2·5 times in its distance from the tip of the inner toe. Dorso-lateral fold discontinuous, often indistinct. Dorsum warty. Dorso-lateral and mid-dorsal light lines usually absent, sometimes indicated in juveniles. Axillæ, groins, concealed surfaces of the femora, tibiæ, and tarsi black, with prominent circular yellow spots.

Specimens examined.—" W. Australia " (7), Mt. Toolbrunup W.A. (7), Baldwin's Lake, north of Mt. Toolbrunup (1), Scaddon (1).

The relationships of these three forms are difficult to assess on the material available. A appears to be the form of eastern New South Wales which has been introduced into New Caledonia (? and New Zealand); no specimens showing a transition with B have been seen, but the geographical area where the intermediates might be expected is S.W. New South Wales, and no specimens from that region have been examined. B appears to be widely distributed throughout Tasmania, Victoria, (South Australia ?), and West Australia. Form C, however, occurs in the same geographical region as B, and both forms appear to occur in the vicinity of King George's Sound, but whether there is any intergradation appears uncertain. Loveridge (1935, p. 49) suggests that there may be, but he was basing his conclusions on the degree of pigmentation of the lower surfaces, and does not mention the much more obvious colour differences of the black, yellow-spotted groins and legs. On the whole, the probability seems to be that A and B are subspecies, whereas C may be a distinct species. It is to be hoped that herpetologists in Australia may consider the matter with a sufficiency of material, but until that has been done the three forms may be known as :—

A. *Hyla aurea aurea* Lesson.

Hyla aurea Lesson, 1830, Voy. 'Coquille,' ii. p. 60, pl. viii. fig. 2 (type-locality : Bathurst, Macquarie Riv., N.S.W.).
Ranoidea jacksoniensis Tschudi, 1838, Mém. Soc. Sci. Neuchâtel, 1839, p. 76 (no specific description) : Duméril and Bibron, 1841, Erpét. Gén. viii. p. 602 (type-locality : Port Jackson).
Ranoidea resplendens Girard, 1853, Proc. Acad. Philad. vi. p. 422 (type-locality : Wollongong, Illawarra, N.S.W.).
Fanchonia elegans Werner, 1893, Zool. Anz. p. 82 (type-locality : "Tropical Africa").

B. *Hyla aurea raniformis* (Keferstein).

Hyla aurea Gray, 1841, in Grey, Journ. Expl. Australia, ii. p. 436 (part), pl. viii. fig. 3.
Chirodryas raniformis Keferstein, 1867, Nachricht. Univ. Göttingen, p. 358 (type-locality : "Australia").

Keferstein's description of the dorsum as warty and of the presence of a mid-dorsal line make this application of the name seem probable.

C. *Hyla cyclorhynchus* Boulenger.

Litoria aurea var., Günther, 1870, Proc. Zool. Soc. London, p. 462, pl. xxx. fig. 3.
Hyla aurea var. *cyclorhynchus* Boulenger, 1882, Cat. Batr. Sal. Brit. Mus. ed. 2, p. 411 (type-locality : W. Australia).

Günther, in referring to the type-specimens, speaks of them as being from "Tropical parts of Australia, of the north as well as west," but there is no record in the British Museum of such data. The specimens were received in 1869 and 1870 from Dr. Krefft, and it is possible that they may have been part of the collection made by Masters in 1866 in W. Australia (*cf.* Fletcher, 1893, p. 233), and probably come from the neighbourhood of King George's Sound. The colour of the species in life is as follows :—

"*Dorsally* ground-colour grey with large green (bright olive-green) spots each surrounded by a bronze-brown zone ; some of the brown spots too small to have a green centre.

"*Ventral surface* pale grey, reticulate with brown ; granular texture.

"*Hind legs*, posterior side of thighs black, with pale yellow and light blue spots. Lower surface of thigh similar to ventral surface of the body. Under surface of tibia and tarsus pale yellow ground-colour and coarse reticulation of deep brown. Anterior side of thigh and hinder part of flank similar.

"*Foreleg* above like dorsum of body; beneath like ventral surface. Under the armpits yellow with coarse dark brown reticulations.

"*Iris* golden brown, finely reticulated with dark brown. Pupil horizontal. D. L. SERVENTY."

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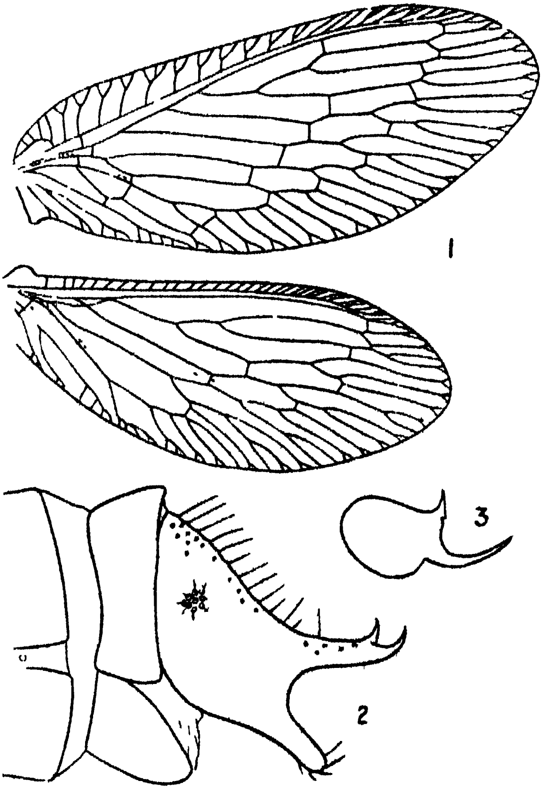
XXXI.—*New Species of Neuroptera.* By D. E. KIMMINS, Department of Entomology, British Museum (Natural History).

THE material from which the following descriptions have been drawn up was collected by Mr. G. M. Henry during his expeditions to South India in 1936 and 1937 on behalf of the British and the Colombo Museums. An account of the various species of Neuropteroid insects taken will probably be published later, but in the meantime it has been considered desirable to publish descriptions of the two new species so far obtained. I understand that the primary object of the expeditions was to collect Orthoptera, and consequently other orders did not receive so much attention.

Hemerobius indicus, sp. n. (Figs. 1–3.)

♂. Head luteous, marked with dark brown on the genæ and behind the eyes. Palpi brownish yellow; eyes bronzy black. Antennæ luteous, becoming slightly brownish at the apices; basal segments brownish externally. Thorax above dark brown, with a luteous median longitudinal stripe. Legs luteous. Abdomen luteous. Anal plates broad and furcate, the branches divergent and separated at their bases by a rounded excision; upper branch rather longer than the lower, incurved and terminating in a pair of acute spurs. Processes of the ædeagus slender and hook-like, curving upwards, parallel to each other and widely separated.

Fore wing elongate-oval, apex elliptical. Membrane hyaline, with numerous sagittate markings and the apical and posterior margins narrowly pale brown. Cross-veins of the inner and outer gradate series brown, faintly bordered, but not forming transverse fasciæ. A distinct blackish spot at the basal cross-vein connecting M_{3+4} and Cu_1, and paler spots at the bases of the branches of *Rs*.



Figs. 1–3.—*Hemerobius indicus*, sp. n., ♂. 1, Wings; 2, apex of abdomen from side; 3, tenth sternite and ædeagus from side.

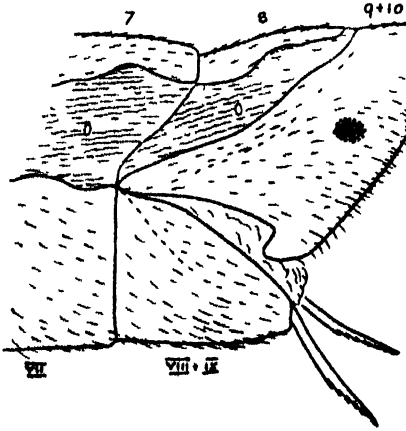
Venation pale, speckled with brown. Three branches to *Rs*, five cross-veins in the inner and eight in the outer gradate series. Hind wing hyaline, venation pale, except gradate veins, which are brownish. Two cross-veins in inner and six in outer series.

Length of anterior wing	....	7 mm.
,, ,, posterior ,,	....	6 ,,

Holotype ♂, S. India, Kodaikanal, 7000 ft., 23. iii. 36 (*G. M. Henry*), B.M.–C.M. Expn. to S. India, 1936, in the British Museum.

This species appears to be closely related to *H. greeni* Banks (described from Ceylon), but differs in the form of the anal plates of the male. Banks describes these as "furcate, superior process acute, curved towards the other appendage." He does not mention the two acute spurs which are a noticeable feature of the present species, even in a dried state. There are also differences in the number of gradate veins but no doubt this character is subject to some variation.

Fig. 4.

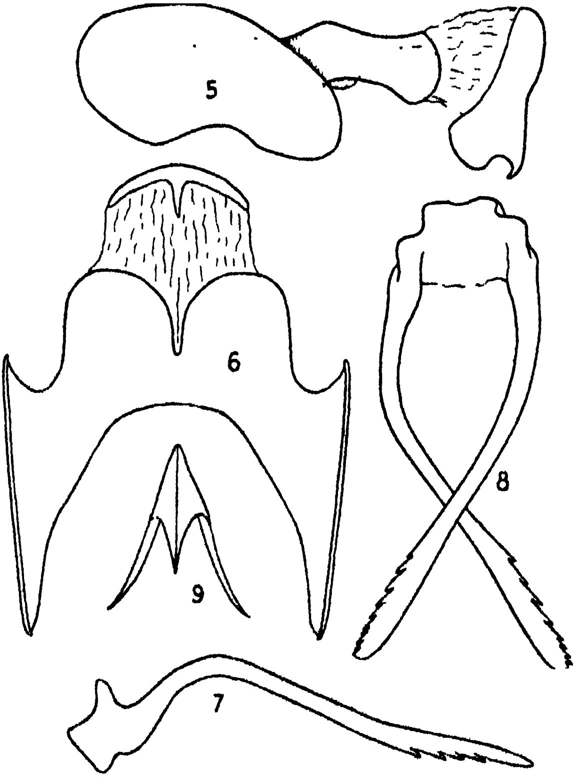


Nothochrysa henryi, sp. n., ♂ Apex of abdomen from side.

Nothochrysa henryi, sp. n. (Figs. 4–9.)

♂. Head yellowish, with reddish markings on the vertex and a paler transverse band on the face, below the antennæ.

Eyes coppery-red. Antennæ with the basal two segments yellowish red, the remainder blackish. Palpi yellowish. Pronotum transverse, parallel-sided, anterior margin evenly rounded, ground-colour yellowish, but largely suffused with red, leaving only the lateral and posterior margins and a mushroom-shaped patch on the disk yellow. Meso- and metanotum yellow, marked with reddish piceous as follows:—Anterior margins of prescutum, scutum, and scutellum; lateral margins of scutum brownish. Legs yellowish, with short golden and blackish setæ. Median and posterior femora with a

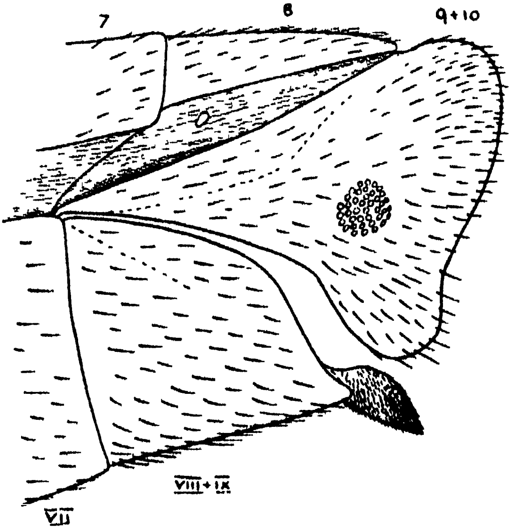


Figs. 5–9.—*Nothochrysa henryi*, sp. n., ♂. 5, tenth sternite and ædeagus from side; 6, same from above; 7, parameres from side; 8, same from above; 9, hypandrium from beneath.

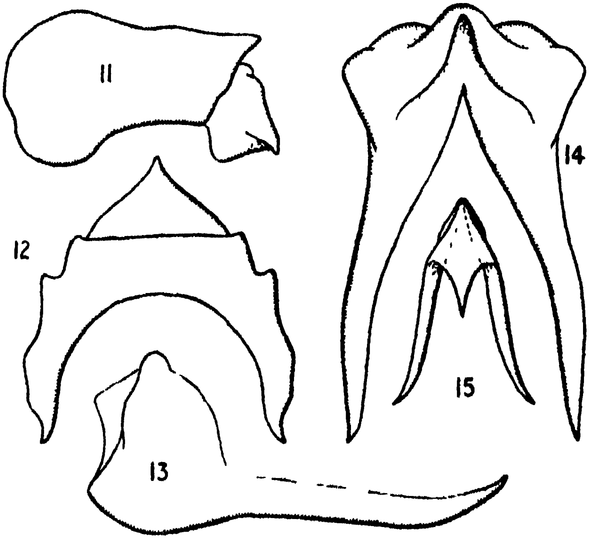
reddish ring before the apex. Tarsal claws reddish brown, with a distinct ventral tooth about mid-way. Abdomen brownish.

Genitalia.—Eighth tergite narrow, ninth and tenth tergites fused to form a pair of anal plates, with convex apical margins: lower apical angle produced downwards in a blunt hook. Beneath the anal plates is a subgenital plate which apparently represents the fused eighth and ninth sternites. It is somewhat trough-shaped, its apical margin slightly produced at its centre, and beyond it project a pair of curved chitinized spines, which cross each other and whose inner apical margins are strongly serrate. In a cleared preparation, these spines are seen to be the apices of the parameres, which are sharply elbowed downwards near their fused bases. Beneath the parameres is a sagittate hypandrium, with long slender "barbs." The tenth sternite (placed above the parameres) is rather flattened, arch-shaped in dorsal aspect, its apical margin produced in two rounded lobes

Fig. 10.



Nothochrysa æqualis Walker, ♂. Apex of abdomen from side with downcurved outer margins. In side view, the bases of the arch appear as thin, slightly concave, reniform plates, set at right-angles to the plane of the arch. Beyond the arch, and attached to it by membrane is the ædeagus, which has the form of a curved plate with a median rib in dorsal aspect and terminates in a small curved hook when seen from the side.



Figs. 11–15.—*Nothochrysa æqualis* Walker, ♀. 11, tenth sternite and ædeagus from side; 12, same from above; 13, parameres from side; 14, same from above; 15, hypandrium from beneath.

Wings elongate, moderately pointed, hyaline, with pale venation, pterostigma long, covering 5–6 cells, opaque, yellow-brown. Ten cross-veins in both gradate series in anterior wing, eight in inner and ten in outer series in posterior wing.

Length of anterior wing	18 mm.
„ „ posterior „	16·5 „

Type ♂, S. India, Travancore, Tenmalai, 12–15. v. 37 (*G. M. Henry*), in the British Museum; paratype ♂,

S. India, Biligirirangan Hills, Dhimbam, 28. iv. 37 (*G. M. Henry*), in the Colombo Museum ; paratype ♂, Calcutta, in British Museum.

In general appearance this species closely resembles *Nothochrysa æqualis* (Walker), but the wings are a little broader. The ♂ genitalia, although they are of the same general pattern, are amply distinct, and I take this opportunity of figuring those of Walker's type. In *æqualis* (figs. 10–15), the anal plates are produced at their lower apical angles in broad rounded lobes. The apex of the fused eighth and ninth sternites bears a membranous flap closely set with black setæ. The parameres are shorter and not serrate, and the tenth sternite and ædeagus have a different form. *Nothochrysa æqualis* appears to be more widely distributed than *N. henryi*, occurring in N. India, Bengal, Federated Malay States, Sumatra, Java, Borneo, and Philippines.

XXXII.—*On a Small Collection of Polychæta from Uruguay.* By C. C. A. MONRO, M.A., Assistant Keeper in the Department of Zoology, British Museum (Natural History).

DR. ERGASTO H. CORDERO of Montevideo has had the kindness to send me a few Polychætes collected at the mouth of the River Plate. Among them is a brackish water Spionid which I have described as a new species.

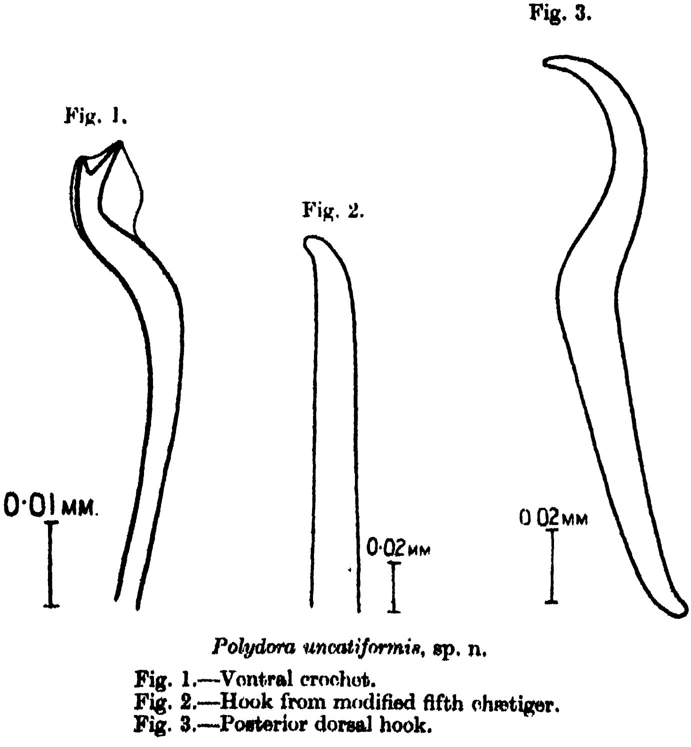
Genus POLYDORA Bosc.

Polydora uncatiformis, sp. n.

Occurrence.—Arroyo de las Brujas, Canelones, Uruguay. The animals live in brackish water among tubes of *Mercierella enigmatica* Fauvel.

Description.—The material is in poor condition. This is a small species, the largest specimen measuring about 5 mm. by 1 mm. at the widest part for c. 40 chætigers. The body is somewhat flattened dorso-ventrally in the front region, and is anteriorly rather wide relatively to its length. There are traces of black transverse markings on the dorsum. The head is emarginate in front and there are two pairs of eyes. The anterior pair lie just behind the insertion of the palps and are separated by twice the distance dividing the hinder pair. The prostomial keel is continued backwards to the third chætiger.

The first chætiger carries ventral capillary bristles, but no dorsal bristles. The branchiæ begin at the second chætiger, are absent from the fifth and probably the sixth chætiger and, as far as can be seen, are continued over about the anterior three-fourths of the body. They are very small in front of the modified fifth chætiger, but in the middle region are long enough to meet across the back. The relation between the gill and the pedal lamella cannot be made out. In the anterior region there are both dorsal and ventral capillary bristles. The hooded



Polydora uncatiformis, sp. n.
Fig. 1.—Ventral crochet.
Fig. 2.—Hook from modified fifth chætiger.
Fig. 3.—Posterior dorsal hook.

ventral crochets (fig. 1) first appear at the seventh chætiger. They are about four in number and have simple bidentate tips. The modified fifth chætiger carries about six plain hooks without secondary processes (fig. 2), and one or two lanceolate chætæ. About the last twelve chætigers carry a single large dorsal hook (fig. 3), with a subterminal enlargement of the shaft. This posterior hook-bearing area is abranchiate. The pygidium is damaged and I cannot make out its precise structure. It appears to consist of a small rounded lobe with a pair of small lateral cirri.

Remarks.—This species is close to *Polydora* (*Boccardia*) *uncata* Berkeley (1927, p. 14) described by Berkeley from Vancouver Island, and afterwards by Okuda (1937, p. 238) from Japan. In fact, so closely do these specimens agree with Berkeley's account that I hesitated to make the separation, but the present form differs greatly in size, being much smaller than Berkeley's species, and in the arrangement of the anterior eyes; and it also appears to occupy a very different habitat.

It is noteworthy that *Polydora amarincola* Hartman (1936, p. 49), which occupies a very similar habitat among tubes of *Mercierella enigmatica* Fauvel in the brackish waters of Lake Merritt, Oakland, California, is a very different species, with branchiæ beginning on the eighth segment and no posterior dorsal hooks. Hartman's species was also taken in the Oakland estuary and in San Francisco Bay. It appears to be euryhaline, as is also *Polydora brachycephala* Hartman.

Genus NEREIS Cuvier.

Nereis succinea (Leuckart).

Fauvel, 1936, p. 312.

Occurrence.—Playa de las Flores, Maldonado, Uruguay, under stones on the beach (8). Rio de la Plata, coast of Montevideo, under stones on sand (10).

Distribution.—North Sea, Atlantic, Mediterranean East coast of America, Panama Region, California.

Remarks.—Treadwell (1925, p. 1) described a *Nereis* (*Neanthes*) *australis* from off Punta del Este, Maldonado, Uruguay, which I believe to be identical with this species.

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XXXIII.—*Two new Oriental Species of* Macrocentrus (*Hym., Brac.*). By G. E. J. NIXON, B.A., Imperial Institute of Entomology.

THE two following species are introduced as new chiefly because a name has been urgently requested for the first-mentioned of them. I can find no description of Oriental forms with which they exactly agree. In view of the fact, though, that the species of *Macrocentrus* are known to be very variable in colour and the older descriptions are usually inadequate to permit of determination on structure, I can not be certain that these two species really are unknown to science. On the other hand, and considering how few *Macrocentrus* have been described from the Old World, it is very probable that many species await discovery.

In describing the two forms below, both of which have been bred from known hosts, I have obtained much help from Muesebeck's revision (1932) of the Nearctic species of the genus; it seems to me to be the only critical contribution to the taxonomy of *Macrocentrus* that has ever been written.

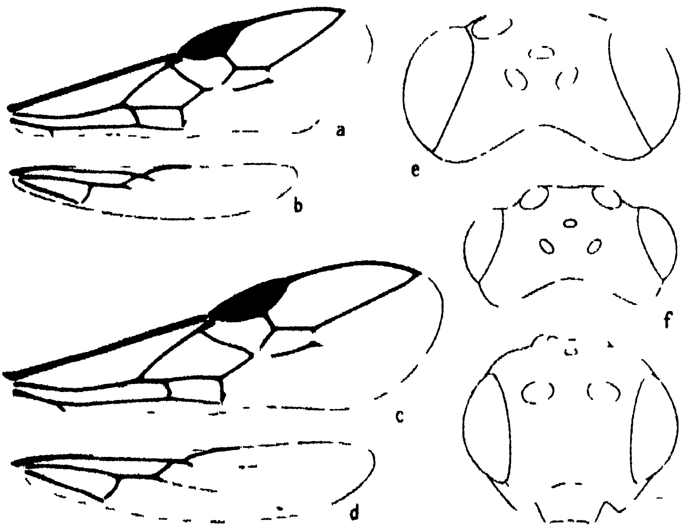
Subfamily *MACROCENTRINÆ*.

Macrocentrus homonæ, sp. n.

♂♀. Head and abdomen black. Thorax clear reddish-brown except propodeum, which is black, and postscutellum together with the apical margin of the scutellum, which are blackish. Hind tibiæ, except for the short, narrowed, basal part, dark brown, nearly black ; hind tarsi darkened except base of each segment ; legs otherwise clear reddish-brown to reddish-yellow ; sometimes coxæ and trochanters paler. Palpi whitish-yellow. Antennæ dark brown, the first three segments approaching the colour of the lighter parts of the thorax.

♀. *Head* (fig. 1 *f*, *g*). Face with scattered, somewhat ill-defined punctures. Clypeus separated from the face by a well-defined groove, which shows as a distinct notch when the head is seen in profile. Ocell-ocular line $2\frac{1}{2}$ times as long as the greater diameter of a posterior ocellus. Malar space slightly shorter than the length of the clypeus. Third segment of the maxillary palpi shorter than the second segment of the funicle, 5 : 4. Antennæ with 39–40 segments. *Thorax* : Mesopleura with small, scattered punctures, which are more or less absent on the

Fig. 1.



(*a*, *b*) Wings of *Macrocentrus homonæ*, sp. n., ♀ ; (*c*, *d*) wings of *M. calacte*, sp. n., ♀ ; (*e*) head, from above, of *M. calacte*, sp. n., ♀ ; (*f*) head, from above, of *M. homonæ*, sp. n., ♀ ; (*g*) head, from m lower, flattened part. Metapleura almost smooth over its greater central part, at most with some ill-defined punctures; metapleural tooth showing as a rounded lobe. Propodeum mostly rugulose, but becoming smooth at each anterior corner against the postscutellum. Wings (fig. 1 *a*, *b*): fore wings very slightly but evenly darkened, stigma obscure brownish-black, unicolorous; submedian cell evenly hairy all over its apical half. Legs: all the trochanters armed with minute teeth outwardly; hind coxæ smooth and polished except for minute, setiferous punctures; longer spur of the hind tibiæ less than half the length of the basal segment of the hind tarsus; hind tibiæ, except for the conspicuously narrowed, basal part, clothed densely with short, brown hairs and appearing thick and blackish to the naked eye. Scutellum half as long as the propodeum. *Abdomen* clearly longer than the head and thorax together, very slender. Tergite 1 with a well-defined impression at base, fully three times as long as its apical width, about 13 : 4, and finely, longitudinally, aciculate, except at basal half, where the aciculations tend to break up; 2 and 3 similarly aciculate, except for the apical margin of each, which is smooth; 2 nearly to fully twice as long as wide; remaining tergites more or less smooth. Ovipositor fully as long as the body.

♂. Antennæ with 39–40 segments. Tergite 3 often nearly smooth.

Length: ♂♀, 4·2 mm. (without ovipositor of ♀).

Type in the British Museum.

JAVA. The species described from material bred by C. B. R. King in Ceylon, where it was introduced in 1935, and where it is now becoming an important parasite of the Tea Tortrix, *Homona coffearia* Nietn. Mr. King tells me that he believes it to have no other host in Ceylon.

The life-cycle at 4,500 ft. in Ceylon (temp. 70–75° F.) occupies about seven weeks, of which two are passed in the pupal stage. The species is gregarious, as many as 34 individuals having been bred from a single host.

M. homonæ seems to belong to the same group of species as the common European *M. abdominalis* Fab., from which it differs chiefly in colour and the effect produced by the hind tibiæ with their dense vestiture of brown hairs. In *M. abdominalis*, too, the suturiform articulation of the abdomen is obscured by aciculation, while in *M. homonæ* it is clearly defined.

Macrocentrus calacte, sp. n.

♂♀. Whitish-testaceous, with brown to blackish markings. Head brownish-testaceous. Antennæ pale, slightly darkened apically. Palpi almost white. Lower half of the thorax whitish-testaceous; middle lobe of the mesonotum testaceous, bordered broadly with brown laterally; lateral lobes of mesonotum similarly testaceous, bordered on their outer side, and to a less extent on their inner, with brown. Rest of thorax predominantly brown. Legs: coxæ, except hind pair which are suffused with brown along their upper surface, and trochanters, whitish testaceous like the lower parts of the thorax; elsewhere unicolorous, but showing a more yellowish tint. Abdomen blackish above, pale beneath; beyond the third tergite the pale colour extends farther on to the dorsum. Ovipositor sheaths yellow-testaceous.

♀. *Head* (fig. 1, *e*) markedly wider than the thorax. Face predominantly smooth and shining, with small, widely scattered punctures. Clypeus not delimited above, so that when the head is seen in profile there is no cleft between the clypeus and the face, the surface appearing rather strongly and evenly convex. Temples cut away very sharply behind the eyes. Third segment of the maxillary palpi as long as the second segment of the funicle. Antennæ with 49 segments (2 ♀♀). Ocell-ocular distance to greater diameter of a posterior ocellus as 4 : 3. Malar space hardly two-thirds length of clypeus. Eyes large, occupying virtually the entire lateral surface of the head. Antennal sockets virtually touching the eye-margin. *Thorax*: Mesopleura rather thickly punctured, the punctures somewhat large and tending to be confluent, at least along the impression. Metapleura with punctures over its central part similar to those of the mesopleura; metapleural tooth showing only as a feebly and broadly rounded lobe. Scutellum two-thirds length of propodeum. Propodeum closely reticulate-rugose all over, the sculpture showing a transverse tendency. Wings (fig. 1 *c*, *d*); fore wings distinctive; to the naked-eye the radial cell appears much lighter than the other parts of the wing, being decidedly yellow in tint; otherwise, the fore wing is darkened, especially within the second and third cubital cells; stigma pale brown, slightly paler along its lower borders; metacarp yellow. Legs: all the trochanters with well-defined teeth; middle and hind femora (to a less extent the anterior pair) with an irregular row of minute teeth extending to about middle; longer spur of the hind tibiæ not much more than one-third the length of the basal segment of the hind tarsus, 10 : 27. *Abdomen* very slightly longer than the head and thorax together. Tergite 1 very slightly more than twice as long as its apical width, 15 : 7, deeply impressed at base and finely striated all over; further, it is almost twice as wide apically as basally, and its spiracles are as far from each other as from the base; 2 not much longer than wide, 21 : 17, finely striated to within ¼ of apex; 3 virtually smooth all over Suturiform articulation showing as a smooth groove. Ovipositor slightly longer than the body.

♂. Antennæ with 44 segments (1 ex.).

Length: ♂♀, 5·2 mm. (without ovipositor of ♀).

Type in the British Museum.

FIJI: Suva (*R. A. Lever*), 1 ♂, 2 ♀♀, bred from *Cryptophlebia* sp. (Microlep., Eucosmidæ) on *Inocarpus*.

This species is probably characterised very largely by the unusual pattern of the wings, in combination with the widely postfurcal nervulus and the distribution of colour on the thorax. It is, I think, fairly closely related to *Macrocentrus longipes* Cameron, of which a single ♂ labelled "cotype" and bearing the full data as recorded by Cameron is in the British Museum. The most obvious difference lies in the fore wings: in *longipes* they are slightly darkened but evenly tinted throughout, and the second abscissa of the cubitus is slightly more than half the length of the recurrent, while in *calacte*, as can be seen from the figure, it is much shorter.

It is difficult to seen why Cameron should have considered his *longipes* to be "hardly a typical *Macrocentrus*"; as far as I can see, it is quite typical. Nor does it seem to be particularly characterized. The following notes may be useful in establishing the identity of this species:—head, seen from above, like that of *calacte*, but very slightly more cut away behind the eyes; front tibiæ more strongly narrowed (markedly so) towards apex than towards base;

in *calacte* they are equally, though only very slightly, narrowed towards both ends; metapleural tooth prominent, narrowly rounded; tergite 1 without a clearly defined impression at base.

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XXXIV.—*The Generic Name* Æthalion. By ERROL IVOR WHITE, D.Sc., F.G.S., British Museum (Natural History).

WHILE checking the proofs of the new zoological nomenclator, I found that the generic name *Æthalion*, long used for an important genus of Leptolepid fishes (von Münster, 1842, Neues Jahrb. f. Min. p. 41), was preoccupied among the Hemiptera by *Æthalion* le Pel. and Serv. (1828, Encycl. Méth. (Ins.) vol. x. p. 765), an emendation of *Ætalion* Latreille (1809, in Humboldt, Voy. intér. Amér.—Obs. Zool. p. 378). Apparently there is no available synonym to replace it, and although the casual renaming of genera is to be deplored, in this case it seems to be desirable that this important form should have a properly established name, so that it may be suitably and permanently labelled in the new gallery of fossil fishes now in process of arrangement at the British Museum (Natural History). I therefore propose to call it *Anæthalion*. The genotype, *Clupea knorri* de Blainville (1818, Nouv. Dict. d'Hist. Nat. vol. xxvii. p. 331), of course stands.

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The Molluscs of South Australia.—Part 1. *The Pelecypoda.* By BERNARD C. COTTON and FRANK K. GODFREY. Pp. 1–314, text-figs. 1–340. Adelaide, 1938. Price 7*s*. 6*d*.

THE scope of this authoritative book, and the method of treatment of the subject, are similar to those of the earlier volumes of this excellent series. The author's preface contains a useful account of the most important lists of South

Australian Mollusca previously published, and of the chief collections deposited in the South Australian Museum. This preface is followed by an introductory chapter (pp. 9 23), in which the authors discuss briefly the anatomy and classification of molluscs, their use as food, their distribution, and the methods and gear to be used in collecting, preserving, and labelling them. The remarks on the intertidal fauna are especially interesting.

The systematic section (pp. 24–314) contains good short descriptions of over 300 species of bivalves, collected either on the shore or in the sea to a depth of 300 fathoms. Each species is illustrated by one or more original photographs or drawings, dispersed throughout the text in the appropriate places. Considering the low price of the book the standard of these illustrations is very high. The author and date of introduction of all generic and trivial names are given (though no detailed references are made to publications), and a series of careful and lucid dichotomous keys, referring successively to orders, suborders, families, genera, and species (each of which categories is briefly diagnosed), make it easy to identify any specimen. For the value of this work to be appreciated it is only necessary to point out that the earlier lists referred to above are mere catalogues of species and localities, without descriptions, illustrations, or keys. The present book, moreover, contains accounts of more than 40 species which are not mentioned in any of the previous publications.

In dealing with the crop of subgenera which has arisen in the past few years the authors have taken a middle course, treating the better marked subgenera as if they were genera, and discarding the less well marked ones entirely. As a result most of the names used are of long standing and are familiar to the reader.

The authors of handbooks such as this are not often so excellently fitted for their task as are Mr. Cotton and Mr. Godfrey, both of whom are experienced collectors and systematists. Besides their own collections, they have had available for study in the South Australian Museum long series of specimens and many types, collected principally by Sir Joseph Verco, and it is a result of these various factors that their book is of such great value, not only to the local collector, but to all students of the distribution and classification of Mollusca, wherever they may be working.

It is to be hoped that these authors will soon find time to follow this handbook with another on the Gastropoda. It should be, like the present volume, a really useful book.

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XXXV.—Bibionidæ (*Diptera*) *collected by Mr. F. Plaumann in Brazil.* By F. W. EDWARDS.

THE insects described here form part of a large collection of Diptera recently purchased by the Trustees of the British Museum (Natural History) from Mr. Fritz Plaumann, the material all being collected by him at Nova Teutonia, 27° 11′ S. lat., 52° 23′ W. long. Besides the species described below the common and widely spread *Plecia plagiata* Wied. and *P. collaris* Fabr. were also represented in the collection. The fact that seven of the eight species of *Dilophus* in the collection were hitherto undescribed is noteworthy as illustrating the remarkable wealth of species of this genus which must exist on the South American continent.

Plecia (*Rhinoplecia*) *seminitens*, sp. n.

♂. Black, only stem of halteres and base of femora brownish. Eyes bare, undivided and without any obviously differentiated lower area of smaller facets. Mouth-parts and clypeus folded back under head as usual in this subgenus, but not noticeably elongate; palpi shortish, each of the four segments very little longer than broad. Antennal flagellum short, 6-segmented, terminal segment the largest. Mesonotum with three brightly shining stripes; shoulders and front ends of a pair of narrow deep grooves between the stripes with coarse grey dusting; median stripe not obviously grooved down the middle; similar coarse grey dusting on most of pleuræ, but lower half of sternopleura shining black; a small patch of hair in middle of sternopleura, pteropleura bare. Abdomen shining. Femora somewhat clubbed on distal half; hind tibia slightly and uniformly thickened. Wings with uniform dark smoky tint; *R*4 short and vertical. Hypopygium: tergite pubescent, posterior margin nearly straight, in middle with a small bare shining black triangular process which is curved inwards; styles large and lateral in position, divided distally into two lobes, the upper lobe broad, flat and rounded, the lower small, narrow and thumb-like. Length of body or wing 4 mm.

♀ (?). Resembles the ♂ in most respects, notably in its small size, shining black lower half of sternopleura, and almost uniformly dark wings, but differs as follows:— Mouth-parts even shorter. Antennal flagellum dark brownish, 8-segmented (apart from the nipple-like tip). Mesonotum wholly light reddish. *R*4 more oblique. Length of body or wing 5 mm.

1 ♂ (type), 16. vi. 1937; 1 ♀, 22. xii. 1937.

If I am correct in believing these two specimens to belong to the same species we have here the first instance of sexual dimorphism in colour in the genus *Plecia*, though a similar difference (♂ with black thorax, ♀ with red) is well known and frequent in *Bibio* and *Dilophus*.

P. seminitens is the smallest South American *Plecia* known to me. The ♂ is very distinct from other black species in the hypopygium, especially the laterally placed and bilobed styles. Two ♀ South American *Plecia* have been described with colouring similar to the one described above: *P. vittata* Wied. and *P. discolor* v. d. W. Both of these are larger than *P. seminitens*, and are perhaps to be associated with a male in the British Museum from Theresopolis which also has a reddish mesonotum; this male has the lower part of the sternopleura shining as in *seminitens* but the hypopygium quite different.

Plecia (*Rhinoplecia*) *grisea*, sp. n.

♂. Black, without markings; only stem of halteres pale. Eyes almost completely bare, even on the small lower portion. Antennal flagellum 6-segmented, terminal segment small. Clypeus and mouth-parts folded back under head but not long. Thorax almost uniformly dusted, even on the scutal stripes, appearing grey when viewed from in front. Sternopleura with a very few short pale hairs. Abdomen not shining. Legs somewhat shining; tibiæ and tarsi not noticeably thickened. Wings smoky. Hypopygium with tergite rather large, with broad V-shaped excavation and a very small bilobed process at bottom of V; styles rather large and sub-lateral, ending in a blunt, bare, curved beak.

♀. Colouring as in ♂. Head grey-dusted. Antennal flagellum 9-segmented. Eyes practically bare. Vein *R* 4 more oblique than in ♂. Wing-length, ♂ 7 mm., ♀ 9 mm.

This is evidently related to and perhaps only a variety of *P. maura* Walk. (=*velutina* Mcq.), which has a very similar antenna and hypopygium, but the specimens of *maura* in the British Museum are much larger (wing of ♂ 10–11 mm., ♀ 12–15 mm.) and lack the conspicuous grey dusting on the thorax.

Plecia (*Rhinoplecia*) *pictipennis* Edwards var. *rufovittatus*, nov.

This species was described from a series taken at Castro, Paraná. Specimens taken at Nova Teutonia agree with the types as regards size, structure, and wing markings, but differ rather strikingly in having the shining stripes of the thorax reddish instead of black.

Dilophus trisulcatus Mcq.

Of this large species only the female sex has hitherto been recorded. It has the body, wings, and legs wholly black, and is rather well distinguished from most other South American species of the genus by the median furrow on the mesonotum, which is very pronounced between the combs and also extends back for the greater part of the length of the mesonotum. The front tibia has five dorsal spines in an almost transverse row on a prominence near the middle of the tibia.

The ♂ is smaller than the ♀ (wing-length 5 mm.) and has the median thoracic furrow less distinct and the mid-dorsal spines of the front tibia in a very oblique row (a sexual difference which is seen in many of the species of the genus). It also differs strikingly from the ♀ in having the distal fourth of the wing whitish hyaline.

Dilophus bicoloripes, sp. n.

♂. *Head* black, including appendages. Pubescence of eyes very short and not dense. Rostrum elongate, as long as remainder of head. Antennæ moderately long for this genus, with 2+10 or 2+11 segments, but last three more or less fused, second segment pale at tip. *Thorax* black, scarcely shining; pronotal lobes with rather dense whitish hair, mesonotal hair scanty and rather pale. Anterior comb of about 10 strong blunt teeth, scarcely divided in middle; posterior comb of about 14 smaller teeth, one or two on each side much displaced backwards. Pteropleural hairs very few and white. *Abdomen* brightly shining black except at tip, which is dull black. *Legs*: front coxæ dark brownish; front trochanters, front and middle femora, and basal three-fifths of hind femora rather bright orange-brown; tibiæ brownish, black at tips; posterior coxæ and trochanters and all tarsi black. Pubescence mostly dark, not conspicuous. Front tibia with two strong blunt spines near base and two more about middle, each pair on a raised base; seven blunt spines in the apical row. Middle tibia with numerous dorsal and anterior bristly spines. Hind femur somewhat swollen on distal two-thirds and hind tibia on about the distal half; hind tarsus slender. *Wings* slightly milky, posterior veins pale, stigma dark brown in middle, fading to lighter brown at each end. Median fork sessile; *r–m* scarcely over twice as long as basal section of *Rs*. Halteres yellowish. Wing-length 4·5–5 mm.

♀. *Head* black. Rostrum (excluding the protrusible proboscis) nearly twice as long as eye, back part of head shorter than eye. *Thorax* with mesonotum wholly yellowish, including area between combs; pleuræ largely blackish. *Abdomen* with posterior borders of segments narrowly pale. *Legs* as in ♂, except that (as usual) the spines are stronger and front and middle coxæ are yellowish. *Wings* with rather strong and uniform yellowish-brown tinge.

12 ♂♂, 4 ♀♀.

I know of no other South American *Dilophus* with elongate rostrum, bicoloured hind femora, yellow halteres, and similar arrangement of tibial spines. *D. rhynchops* of Nicaragua, as described by Schiner, has rather similar colouring, but has four spines in the middle row on the front tibia.

Dilophus flavicornis, sp. n.

♂. Eyes with very short and scanty pubescence. Antennæ entirely yellowish, flagellum with six distinct segments apart from the terminal fusion-segment. *Thorax* entirely black; almost the whole surface of mesonotum shagreened like reptile skin (under magnification of 100), and therefore appearing quite dull, but pleuræ more shining. Anterior comb of 10–12 sharp teeth arranged practically in a semicircle (the row much more convex than usual); posterior comb of about 6–8 very small teeth in a straight row, forming a diameter to the semicircle of the anterior row. *Abdomen* shining black, with scanty dark pubescence. *Legs* with front coxæ and all trochanters, femora, and tibiæ yellow, only tarsi and posterior coxæ blackish. Front tibia slender, with four rather small sharp spines in a group just before middle of dorsal surface; spur not longer than the seven sharp apical spines. Middle tibia without obvious spiny bristles. Hind femora with only the basal third slender. Hind tibia rather slender, but slightly thickened on distal two-thirds, spurs very short, less than half the tibial diameter. *Wings* milky-white, with deep black stigma, veins at base yellowish; in shape rather broad, but anal area not very large, lobe right-angled. Median fork wider than usual, branches divergent almost from base; *r–m* less than twice as long as base of *Rs*; cubital fork short and wide, *Cu* 1 (instead of *Cu* 2 as in most *Dilophus*) almost continuing direction of stem; first section of *Cu* 1 slightly longer than second section and about equal in length to *Cu* 2 (instead of markedly shorter as in most species). Halteres with black knob. Wing-length 3·5 mm.

♀. *Head* black, somewhat shining but rugose, about half as long again as broad; rostrum not produced; occipital region not much produced, but anterior ocellus well behind eye. Antenna with scape and first three or four flagellar segments yellowish, rest dark; flagellum 8-segmented. *Thorax* much as in ♂, but sides of mesonotum reddish, especially posteriorly. *Abdomen* shining black, cerci black. *Legs* much as in ♂, but hind tibia somewhat sinuous (possibly an individual anomaly).

Wings smoky, darker anteriorly, stigma large and black, extreme base yellowish. Venation as in ♂. Length 3·5 mm.

2 ♂♂, 24. v. 38 ; 1 ♀, 10. v. 37.

In colour of antennæ, nature of surface of mesonotum, and venation of wings this species is unique among South American *Dilophus* known to me. *D. pictus* Schin. (Colombia) is described as having the antennæ yellow with a black tip, but does not seem to be nearly related to the new species.

Dilophus megacanthus, sp. n.

♀. *Head* dull black, finely rugose, not much longer than broad, rostrum not produced, anterior ocellus level with posterior margin of eye. Antennæ with scape yellow ; flagellum black, segments short and broad, not easily counted but probably ten in number. *Thorax* mainly light brownish, rather shining, scutellum and lower part of pleuræ darker , scutum with more or less distinct indications of two or three dark stripes. Combs each with 8–10 strong blunt teeth, those of anterior comb very large and in a regularly spaced row. Pubescence scanty and pale. *Abdomen* with tergites shining dark brown or blackish, membrane mainly or entirely pale ; cerci reddish. *Legs* mainly yellow ; hind coxæ dark brown ; posterior trochanters black ; hind femora narrowly black at tip, tips of tarsal segments blackened. Front femur very stout ; front tibia short and stout, with two very strong spines near base, *two* more (wide apart, the outer one more distally placed) near middle, and eight (apart from the short spur) at tip. Middle tibia with numerous short spiny bristles dorsally. Hind tibia and all tarsi with long but rather scanty black hair, chiefly on dorsal surface ; hind tibial spurs long, equal to tibial diameter. *Wings* for the most part only slightly tinged and posterior veins not very dark, but stigma large and blackish, a brown cloud in costal cell, and another small and diffuse but obvious one over *m–cu*. Median fork shortly stalked ; *r–m* barely twice as long as base of *Rs*. Halteres black. Wing-length 4·5 mm.

♂. Pubescence of eyes dense and of moderate length. Antennæ entirely blackish or with scape only indistinctly paler. Thorax and abdomen entirely black, shining ;

combs much as in ♀. Legs mainly light brownish, very little darker than in ♀, only the posterior coxæ entirely blackish; tibial structure also much as in ♀, the front tibial spines being arranged in the same way and almost equally stout and blunt. Wings in the five specimens available exhibiting considerable variation in colouring: two have a slight brownish tinge on the membrane, stigma large and blackish, posterior veins darkened, but no cloud over *m–cu*; one is similar but has posterior veins scarcely darkened and cloud over *m–cu* faintly indicated (chiefly by reflected light); in the other two the wings are whitish, stigma inconspicuous and posterior veins pale; all the specimens are alike in all respects except the colouring of the wings.

4 ♂, 4 ♀, 24. v. 1938; 1 ♀, 18. v. 1937.

This is a very distinctive species on account of the armature of the front tibia and the long spurs of the hind tibia; *D. calcaratus* Edw. of Chile is the only other South American species in which I have noted long hind tibial spurs, but it is not otherwise very similar to the present form. The front tibial spines are also unusually strongly developed in the male sex.

The variation in colour of the wings in the male is unusual, and it is possible that I have confused more than one species in the series; hence I have selected a female as type.

Dilophus flavitarsis, sp. n.

♂. *Head* black including appendages. Rostrum scarcely produced. Antennal flagellum with 7 distinct segments apart from the terminal fusion-segment. Pubescence of eyes short and scanty. *Thorax* wholly black, including pubescence; mesonotum only slightly shining, more so towards sides, rather strongly rugose in front; anterior comb consisting of 5+5 small sharp teeth, the two groups well separated in middle. *Abdomen* black, moderately shining, with black pubescence. *Legs* black except for the hind tarsi, which are largely yellowish, middle tarsi inconspicuously pale at base. Front tibia slightly thickened in middle and with short dense black pubescence beneath; one short sharp dorsal spine before middle and an irregular transverse row of 5 spines just beyond middle; tip with 7 sharp spines in addition to the spur, which is markedly longer than any of the spines, Middle tibia with a few spiny bristles anteriorly as usual. Hind femora swollen on distal half, hind tibiæ and tarsi slender; hind tibial spurs very short, less than half the tibial diameter; tarsi with longish but not dense dark hair. *Wings* rather light brownish, faintly darker around *m–cu*; stigma large and black. Median fork with very short stem; *r–m* fully three times as long as base of *Rs.* Squamæ blackish with black fringe. Halteres black. Wing-length 4 mm.

♀. *Head* shining black; occipital region about as long as eye. Antenna with scape yellowish, flagellum all black, 9-segmented. *Thorax* somewhat shining, not rugose, black except above front coxæ, where it is yellowish. Combs much as in ♂. *Abdomen* shining black, cerci black. *Legs* as in ♂. *Wings* smoky, darker along anterior border, all veins blackish. Length 4 mm.

1 ♂, 1. vii. 37, 1 ♀, 24. v. 38.

The yellowish hind tarsi (with legs otherwise black) perhaps provide the most distinctive feature of this species.

Dilophus plaumanni, sp. n.

♂. *Head* black, second antennal segment yellowish distally and beneath. Pubescence of eyes short and scanty. Rostrum scarcely produced. Antennæ rather short, with 2+8 distinguishable segments. *Thorax* slightly shining, mesonotum mainly or entirely yellowish, but shoulders, scutellum, and pleuræ more or less darkened, postnotum black. Pubescence black. Anterior comb of about 10 rather sharp-pointed spines arranged in two slightly separated groups. Posterior comb as usual with small lateral teeth displaced backwards. *Abdomen* black, moderately shining, pubescence black. *Legs* black except front coxæ, which are brownish yellow. Front tibia with a single short dorsal spine just before middle, four spines in an irregular oblique row just beyond middle, the one or two on inner (anterior) side of this row often much displaced distally; seven rather sharp apical spines equalling the spur in length. Middle tibiæ with only two or three short bristly spines on anterior surface and one or two at tip. Hind tibial spurs very short. Hind femur and tibia with longish black pubescence. Hind femur swollen on about the distal half, tibia and tarsus slender. *Wings* smoky blackish, darker towards costa, stigma large and black, all veins dark. Median fork sessile; *r–m* fully three times as long as base of *Rs*. Halteres black. Wing-length about 4 mm.

♀. Colouring as in ♂, except that front femur as well as coxa is pale (legs otherwise black). Head with occipital region elongate, anterior ocellus well behind posterior edge of eye, but as in ♂ the rostrum is scarcely produced beyond antennæ, which are inserted almost in line with anterior margin of eyes. Abdomen black, including ovipositor and whole lateral membrane. Posterior thoracic comb without displaced lateral teeth. Front tibia with the single spine nearer base than in ♂, the four spines forming a more regular transverse row on a ridge in middle of tibia. Wing-length 5–6 mm.

11 ♂♂, 18 ♀♀.

This seems to be related to *D. occipitalis* Edw., differing (in ♀ sex) in the dark antennal scape, black legs, and fewer spines in middle of front tibia. Apart from the allied new species described below and the much larger Chilean *D. dorsalis* Phil. it is the only South American *Dilophus* known to me in which the mesonotum of the male as well as of the female is pale, though the same will probably be found to be true of *D. occipitalis*.

Dilophus dichrous, sp. n.

♂. *Head* black except antennal scape, which is clear yellow. Pubescence of eyes very short and scanty. Rostrum not produced. Antennæ with 2+9 segments, but the last two or three not clearly separated. *Thorax* entirely yellowish, including even the postnotum, surface shining, hair scanty and dark. Anterior comb of 12–14 rather small sharp spines rather irregularly arranged and indistinctly separated into two groups; posterior comb of only about 6 very small and widely spaced spines, apart from one or two on each side displaced backwards. *Abdomen* shining black, pubescence scanty and black, hypopygium small and brownish. *Legs* yellow, including all coxæ and trochanters; front tibiæ blackish towards tip; front tarsi all blackish; middle and hind tarsi largely pale. Tibial armature and shape of hind legs as in *D. plaumanni*. *Wings* with only a slight smoky tinge over most of the surface, posterior veins hardly darker than membrane, but stigma dark brown and fairly conspicuous. Venation as in *D. plaumanni*. Halteres black. Wing-length about 3·5 mm.

♀. Head shining black, occipital region produced as in *occipitalis* and *plaumanni*, rostrum also somewhat produced, the antennæ inserted distinctly in front of (below) anterior edge of eye. Antennal scape yellow as in ♂, but flagellum with only 8 segments, all rather distinctly separated. *Thorax* entirely shining yellowish as in ♂. Anterior comb with about 12 teeth, stronger, less pointed, and more regularly placed than in ♂; posterior comb with about 10–12 teeth. *Abdomen* with blackish tergites and sternites; lateral membrane mainly yellowish but with narrow blackish segmental bands; ovipositor yellowish. *Legs* yellow as in ♂; tibial armature as in *plaumanni* ♀, the four spines in middle of front tibia more transversely placed than in ♂. *Wings* darker than in ♂, especially towards anterior margin, but not nearly so dark as in *plaumanni*. Length about 3·5–4 mm.

2 ♂, 25. v. 38; 2 ♀, 21. ix. 37 and 17. xi. 37.

The female of this new species bears some resemblance in colouring to the Chilean *D. luteus* Edw,. but there are many structural differences, and, moreover, the male of *D. luteus* has a black thorax.

Dilophus minor, sp. n.

♂. *Head* black, antennal scape yellowish; antennæ shorter than in *plaumanni* or *dichrous*, flagellum with only five distinct segments apart from the three forming the larger terminal segment. Pubescence of eyes very short and scanty. Rostrum not produced. *Thorax* and *abdomen* entirely black, shining. Combs each of about 8–12 sharp spines. *Legs* in colour and armature much as in *dichrous*; front tarsus slightly yellowish at base of first segment; hind coxæ darkened; middle tibia without bristly spines. *Wings* slightly milky, posterior veins pale; stigma represented by a narrow blackened area bordering vein *R* 1. Median fork sessile; *r–m* not quite three times as long as base of *Rs*; cubital fork normal. Halteres black. Wing-length 2·5 mm.

5 ♂♂, v. 37, xi. 37, and v. 38.

This very small species has some superficial resemblance to *D. microcerus* Edw., differing in arrangement of tibial spines and various other points. I do not know any other South American species of the genus which shows a combination of black thorax with yellow scape and legs and milky wings.

XXXVI.—*A Key to the Genera of the Suborder Cyphophthalmi, with a Description and Figures of* Neogovea immsi, gen. et sp. n. (*Arachnida, Opiliones*).

By H. E. HINTON, Junior Curator, University Museum of Zoology, Cambridge.

IN this paper a new genus and species is described, and the species described by Davis as *Siro americanus* is transferred to the genus *Parasiro* Hans. & Soer. A key to the world genera of the suborder is also given. The illustrations of parts were done by myself with the aid of a camera lucida. Lines next to figures refer to a length of 0·20 mm.

The Cyphophthalmi is a small suborder of the Opiliones, of which eleven genera and some twenty-three species have been described. They differ from the other two suborders of the Opiliones—Laniatores and Palpatores—in having the odiferous glands situated on conical tubercles on the dorsum of the cephalothorax and the genital opening exposed, not covered by an operculum. The only family—Sironoidæ—is divided into two subfamilies, as follows:—

1.	Coxæ of first and second pair of legs movable, third and fourth coxæ fused and immovable	SIRONINÆ.
	Coxæ of only the first pair of legs movable, second, third, and fourth coxæ immovable and fused	STYLOCELLINÆ.

A Key to the Genera of Sironinæ.

1.	Coni fœtidi removed from the lateral margin of the cephalothorax, so that from a dorsal view they do not project beyond lateral margin of cephalothorax	4.
	Coni fœtidi near lateral margin of cephalothorax, so that from a dorsal view they appear to project beyond the lateral margin of the cephalothorax	2.
2.	Abdominal tergites fused into a great dorsal plate, so that the sutures between the tergites are not visible. (Oregon.)	*Holosiro* Ewing (1923).
	Sutures between abdominal tergites visible.	3.
3.	Corona analis with no sutures dividing the eighth and ninth sternites from the ninth tergite; metatarsi of the four legs very much shorter than the tarsi; upper side of basal segment of chelicerae without a transverse ridge. (Europe.)	*Siro* Latr. (1797).
	Corona analis with the eighth and ninth sternites distinctly divided from the ninth	

tergite by a suture; metatarsi of the four legs as long or nearly as long as the tarsi; upper side of chelicerae with a distinct transverse ridge at about the middle. (Europe and North America.) .. *Parasiro* Hans. & Soer. (1904).
4. Trochanter of palp with a ventral process. (Africa and New Zealand.) .... *Purcellia* Hans. & Soer. (1904).
Trochanter of palp without a ventral process .... 5.
5. Corona analis with the eighth and ninth sternites distinctly divided by a suture from the ninth tergite. (Ceylon.) .... *Pettalus* Thor. (1876)
Corona analis with the eighth and ninth sternites completely fused with the ninth tergite. (South Africa.) .... *Speleosiro* Lawrence (1931).

Parasiro americanus (Davis).

1933. *Siro americanus* Davis, Journ. New York Ent. Soc. xli. pp. 49–52, 1 plate.

This species does not belong in *Siro* for the following reasons:—(1) In *Siro* the corona analis has no sutures dividing the ninth tergite from the eighth and ninth sternites, whereas in his figure of *americanus* the ninth tergite is divided distinctly from the eighth and ninth sternites by a suture as is the case in *Parasiro*. (2) *Siro* is the only genus of the suborder in which the basal segment of the chelicerae has no transverse ridge on the upper side. The figure given by Davis shows that *americanus* has a very well developed ridge. (3) The metatarsi of the four walking-legs are very much shorter than the tarsi in *Siro*, whereas in his figure of *americanus* the metatarsi are nearly as long as the tarsi—a condition found only in *Parasiro*. (4) The anterior margin of the cephalothorax is, as he says, nearer the condition found in *Parasiro* than in *Siro*. (5) The claws in *Siro* are not dentate, whereas in *americanus* they are. The claws in *Parasiro* are dentate.

Davis (*supra*, p. 51) says: "The species is related to *Siro* by the presence of the posterior prothoracic suture, in having the stink-gland tubercles conical and remote from the margin of the cephalothorax." A number of genera in the subfamily Sironinae have a posterior cephalothoracic suture and a few do not, but the reasons given above have, in my opinion, enough weight to exclude it from *Siro*. The only character I can find in the description and figures of *americanus* which does not agree generically with *Parasiro* is the presence of the posterior cephalothoracic suture, which is absent in *Parasiro*. It seems best at this time to enlarge the scope of the genus

Parasiro rather than to erect a new genus differing from *Parasiro* in only one character the generic importance of which is not known. All genera of this suborder have the stink-glands opening on the apex of conical tubercles, so that we may discount this part of the statement. The coni fœtidi are in no genus on the lateral margin, but even in those genera in which they are nearest the lateral margin, e. g., *Holosiro*, *Parasiro*, *Siro*, *Stylocellus*, *Ogovea*, *Paragovia*, etc., where from a dorsal view they appear to project beyond it, they are in no case nearer than a distance equal at least to the diameter of the cone at base. And these genera are always considered as having the coni fœtidi near and not remote from the lateral margin of the cephalothorax.

A Key to the Genera of Stylocellinæ.

1.	Eyes present. (East Indies.)	*Stylocellus* Westwood (1874).
	Eyes absent	2.
2.	Abdominal tergites with a distinct median longitudinal furrow	3.
	Abdominal tergites without a median longitudinal furrow	5.
3.	Trochanter of palp with a ventral process. (New Zealand.)	*Rakaia* Hirst (1925).
	Trochanter of palp without a ventral process.	4.
4.	Genital opening very short and broad; femoral part of palp much thicker and about as long as trochanterial part; anterior margin of cephalothorax produced triangularly at middle. (Africa.)	*Ogovea* Rohwer (1924).
	Genital opening nearly as long as broad; femoral part of palp no thicker but nearly twice as long as trochanterial part; anterior margin of cephalothorax arcuately and broadly emarginate, not produced triangularly at middle. (Brazil.)	*Neogovea*, gen. nov.
5.	Anterior margin of cephalothorax truncate; first leg with the metatarsus only a third as long as the tarsus. (Asia.)	*Miopsalis* Thor. (1890).
	Anterior margin of the cephalothorax produced triangularly at middle; first leg with the metatarsus half as long as the tarsus	*Paragovea* Hansen (1921).

NEOGOVEA, gen. nov.

Eyes absent. Coni fœtidi removed from the lateral margin of the cephalothorax by a space half again as great as the basal diameter of the cones. Anterior margin of cephalothorax broadly and arcuately emarginate. Dorsum with the posterior cephalothoracic suture present;

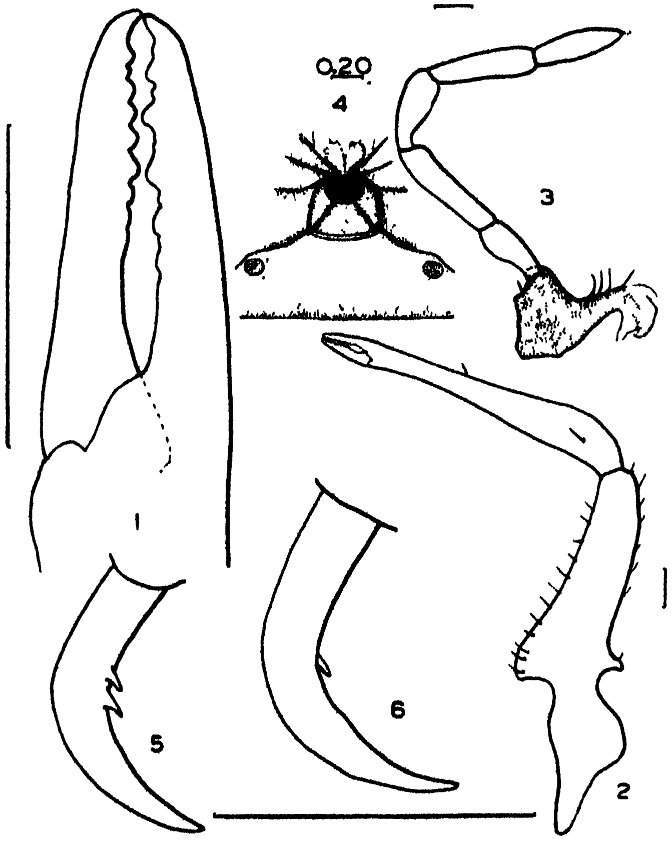
suture between abdomen and cephalothorax present; sutures between abdominal tergites present; with a median longitudinal suture extending from posterior cephalothoracic suture to base of fifth tergite. Genital opening in both sexes nearly as long as broad. Corona analis with no sutures separating the eighth and ninth sternites and the ninth tergite. Coxæ of first pair of walking-legs slightly movable, coxæ of second, third, and fourth pairs of walking-legs immovable and fused to each other. All walking-legs with the metatarsi about half as long as the tarsi; claws of walking-legs with one or more teeth. Trochanterial part of palp without a ventral process; femoral part of palp no thicker and nearly twice as long as trochanterial part. Second segment of chelicerae long and narrow, nearly as long as basal segment; basal segment with a very well developed transverse ridge on upper side at about basal two-fifths.

Genotype: *Neogovea immsi*, sp. n.

It should be noted that in addition to the differences given above in the keys between the old genera and the new genus the male genitalia (figs. 7, 8) are very different from the known types, e. g., *Siro*, *Purcellia*, and *Stylocellus*.

Neogovea immsi, sp. n. (Figs. 1–16.)

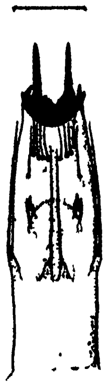
Male.—Length (from tip of abdomen to anterior margin of cephalothorax) 3·5 mm.; breadth (at broadest point, which is in region of second abdominal tergite) 2·1 mm. Surface of body densely and microscopically alutaceous, and in certain lights with a greenish-purple iridescence, which is particularly noticeable on abdominal sternites. *Cephalothorax* with the anterior margin broadly, feebly arcuately, and moderately deeply emarginate, with the base of the emargination feebly bisinuate; on each side of base with a carina extending for about 0·100 mm. posteriorly, these carinæ being about as broad as long. Coni fœtidi 0·175 mm. broad and 0·250 mm. long, being 0·275 mm. from lateral margin of cephalothorax. Surface with only occasional groups of indistinct punctures, which are very shallow, round, and not more than 0·012 mm. in diameter; without hairs except near apex of coni fœtidi, where on each cone there are about six fine, testaceous hairs generally about 0·050 mm. long. *Abdominal tergites* with the surface similar to that of cephalothorax, but very sparsely clothed with fine testaceous hairs similar to those of coni fœtidi and at sides near lateral margins with round, nearly flat-topped granules which are about 0·012 mm. broad and are usually separated by two to five times their diameters; at sides near apex these granules become much rarer. *Ventral surface* clothed similarly to dorsal, but near mouth on inner side of coxæ of first pair of walking-legs with about twenty hairs on



Neogovea immsi, sp. n.

Fig. 1.—Outer view of tip of left chelicera.
Fig. 2.—Outer view of left chelicera.
Fig. 3.—Outer view of right mandible and palp.
Fig. 4.—Ventral view of male, to show genital opening.
Fig. 5.—Claw of front leg of male.
Fig. 6.—Claw of front leg of female.

each side of mouth which are about three times as long as other hairs; here also with numerous granules which are slightly but distinctly coarser than those at sides of dorsum; ventral surface of coxæ of walking-legs 2 to 4 with only an occasional granule at sides; abdominal sternites with numerous punctures similar to those of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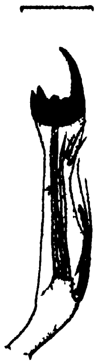
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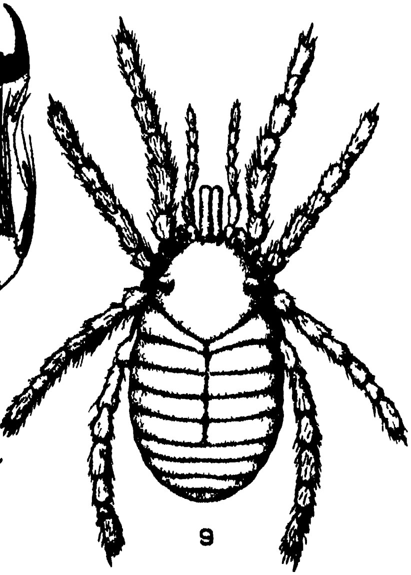
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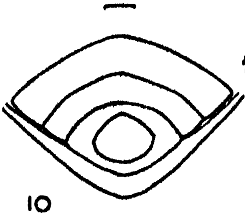
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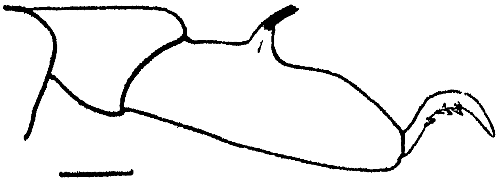
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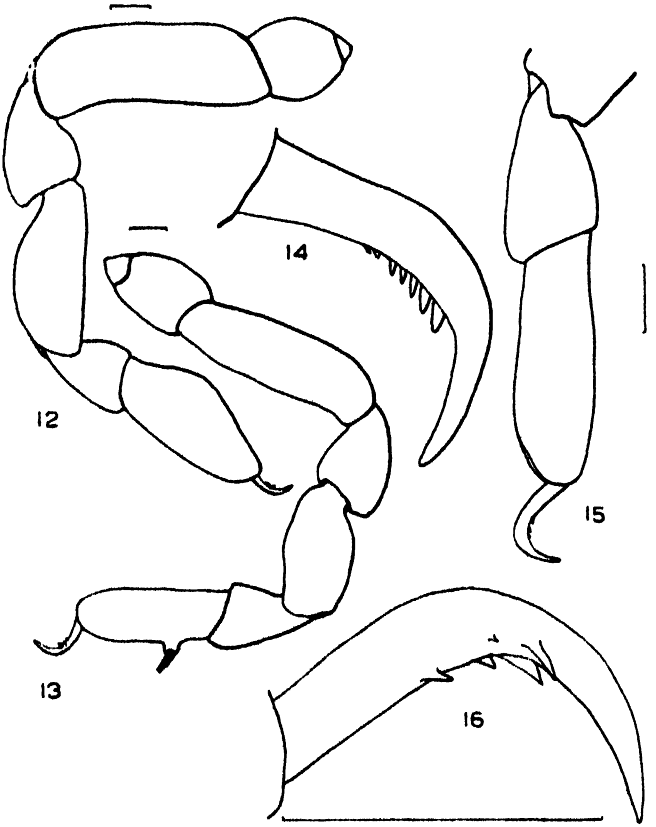
Neogovea immsi, sp. n., ♂.

Fig. 7.—Ventral view (?) of penis.
Fig. 8.—Lateral view of left (?) side of penis.
Fig. 9.—Dorsal view of entire animal, to give the general appearance. The hairs are not placed accurately, but simply to give general appearance, and the stippling is to bring out effects of light coming from the upper left-hand corner, and does not represent punctures.
Fig. 10.—Outline of segments near corona analis.
Fig. 11.—Tip of left hind leg from an outer view.

cephalothorax, and sternites 7 to 9 with a few granules. *Genital opening* not twice as broad as long (fig. 4). *Corona analis* (fig. 10) with no sutures dividing the eighth and ninth sternites and the ninth tergite. *Cheliceræ* (figs. 1 & 2) with the basal segment 1·775 mm.



Neogovea immsi, sp. n.

Fig. 12.—Outer view of front leg of male.
Fig. 13.—Outer view of left hind leg of male.
Fig. 14.—Outer view of left second claw of female.
Fig. 15.—Outer view of right hind leg of female.
Fig. 16.—Outer view of left claw of hind leg of male.

long, second 1·625 mm. long, and third 0·275 mm. long; basal segment with the ventral surface and sides near ventral surface granulate as coxæ of first walking-legs, second and third segments without granules; teeth of chelicerae as figured (fig. 1). *Mandible* (fig. 3) with setae as figured, 0·725 mm. broad and 0·400 mm long; palp with the basal portion of trochanterial segment smooth, apical portion with two setae on ventral side and with surface densely and finely granulate, other segments sculptured similarly to apical portion, but with the hairs becoming much more numerous towards apical portion of palp, so that tarsal portion is moderately densely pubescent; length of segments as follows: trochanterial part 0·375 mm.; femoral part 0·600 mm.; patellar part 0·350 mm.; tibial part 0·525 mm.; tarsal part 0·460 mm.; claw 0·040 mm. *Legs* with the trochanter and femora with only an occasional granule and but sparsely pubescent, the other segments of the legs granulate as described above for the ventral surface of the coxae of the first leg and much more closely pubescent, the ventral portion of the tarsi being very densely so. Front tarsus distinctly swollen ventrally (fig. 12); second, third, and fourth tarsi more or less parallel, the fourth on dorsal surface near outer margin with a large tubercle and from the centre of this tubercle arises a compact tuft of fine hairs. Claw of first leg with two teeth (fig. 5); claw of second leg with a row of eight to nine fine teeth; third claw with three teeth; fourth claw (fig. 16) with one small and four large teeth. *Penis* as figured (figs. 1 & 2).

Female.—Externally similar to male except as follows:—Claw of first leg with only one tooth (fig. 6); second claw (fig. 14) with seven teeth; third with three teeth; fourth (fig. 15) with three teeth. Genital opening nearly as long as broad (0·175 mm.: 0·200 mm.). Female genitalia somewhat similar to that of *Parasiro corsicus* Sim.; without the multi-branched apical seta common to *Siro* and *Purcellia*.

Type.—In the collection of the British Museum (Nat. Hist.). BRAZIL: State of Para, Punta dos Indios, 6–9. x. 1937 (*H. E. Hinton*).

Paratypes.—Eight with the same locality and date as above.

I take great pleasure in naming this species in honour of Dr. A. D. Imms, F.R.S. It was taken under fallen logs in a moist forest while collecting a series of *Peripatus*.

XXXVII.—*The Piaget Collection of Mallophaga.*—Part IV.

By Gordon B. Thompson.

[Continued from Ann. & Mag. Nat. Hist. 1938, ser. 11, vol. i. p. 496.]

Species.	No. of specimens in B.M.	No. of slides.	Hosts.
Lipeurus abnormis Piaget	3 ♀♀, 5 ♂♂.	4	*Puffinus major.*
L. acuminatus Piaget	2 ♀♀.	1	*Excalfactorius australis.*
L. æqualis Piaget	1 ♀.	1	*Phœnicopterus calorhynchus.*
L. albidus Piaget	1 ♀, 1 ♂.	2	*Coracopsis nigra.* *Coracopsis vasa.*
L. angusticeps Piaget	6 ♀♀, 5 ♂♂, 2 imm.	7	*Procellaria cinerea.* *Ibis falcinella.* *Ibis melanocephala.*
L. antennatus Piaget	1 ♀, 1 ♂.	1	*Euplocamus swinhœii.*
L. antilogus Nitzsch in Gebel	1 ♀, 1 ♂.	1	*Otis tetrax.*
L. appendiculatus Piaget	4 ♀♀, 2 ♂♂.	3	*Megapodium duperreyi.* *Megapodium rubripes* var. *gilberti.*
L. appendiculatus var. *major Piaget*	1 ♀ (broken).	1	*Tinamus canus.*
L. assessor Giebel	3 ♀♀.	1	*Sarcoramphus gryphus.*
L. asymmetricus Piaget	4 ♀♀, 4 ♂♂.	4	*Rhea macrorhyncha.* *Rhea darwinii.*
L. baculus Nitzsch in Giebel	10 ♀♀, 9 ♂♂, 7 imm.	23	*Charadrius minor.* *Sula alba.* *Scolopax major.* *Strix flammea.* *Columba turtur.* *Columba domestica.* *Columba capensis.* *Columba trigina.* *Columba bitorquata.* *Columba migratoria.* *Lophophorus resplendens.* *Treron vernans.* *Carpophaga* sp. " Pigeon de Curacao."
L. bicolor Piaget	3 ♀♀, 2 ♂♂.	2	*Tantalus senegalensis.*
L. bifasciatus Piaget	4 ♂♂*.	2	*Pelecanus crispus.*
L. bilineatum Stephens..........	3 imm.	1	*Procallaria glacialis.*
L. breviceps Piaget	1 ♀.	1	*Camptolæmus cinereus.*
L. breviceps Piaget	1 ♂.	1	*Diomedea exulans.*
L. brevicornis Piaget	6 ♀♀ †.	2	*Carbo sulcirostris* (Celebes).
L. capitatus Piaget	2 ♀♀, 1 ♂.	2	*Ibis carunculata.* *Ibis* sp. (Madagascar).
L. castaneus Piaget	2 ♀♀, 2 ♂♂.	2	*Lophophorus impeyanus.*

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* A female is mentioned in the original description, but there is no female in the collection

† A male is mentioned in the original description, but there is no male in the collection.

Species.	No. of specimens in B.M.	No. of slides.	Hosts.
L. cinereus Nitzsch in Giebel	2 ♀♀, 1 ♂.	3	*Perdix coturnix.*
L. differens Piaget	3 ♀♀, 2 ♂♂.	2	*Agelastus meleagrides.*
L. dispar Piaget	2 ♀♀, 1 ♂.	1	*Corythais macrorhynchus.*
L. dissimilis Piaget	1 ♀, 1 ♂.	1	*Ortyx virginiana.*
L. docophoroides Piaget	2 ♀♀, 2 ♂♂.	2	*Ortyx californica.*
L. elongatus Piaget	1 ♀, 1 ♂.	1	*Spizætus cirratus.*
L. emarginatus Piaget	1 ♂.	1	*Totanus ochropus.*
L. exilicornis Piaget	1 ♀.	1	*Sterna* sp. ? (" de Banka ").
L. femoratus Piaget	1 ♀.	1	" Perroquet de Celebes."
L. forcipatus Piaget	1 ♀ *.	1	*Buceros albocristatus.*
L. forficula Piaget	1 ♀.	1	*Epimachus albus.*
L. gambensis Piaget	3 ♀♀, 1 ♂.	2	*Plectropterus gambensis.*
L. genitalis Piaget	1 ♀, 2 ♂♂.	2	*Leptoptilus crumenifer* (" Marabou ").
L. gracilentus Piaget	1 ♀, 1 ♂.	1	*Ibis rubra.*
L. gracilicornis Piaget	1 ♀, 1 ♂.	1	*Fregatta minor.*
L. gracilicornis var. ? Piaget †	?	?	*Phalocrocorax carbo.*
L. grandis Piaget	1 ♀, 1 ♂.	1	*Thalassidroma pelagica.*
L. gyricornis Denny	2 ♀♀, 3 ♂♂, 3 imm.	4	*Sula australis.* *Sula bassana.*
L. hamatus Piaget	1 ♀.	1	*Ortyx leucotis.*
L. hebræus Nitzsch in Giebel	2 ♀♀, 1 ♂.	2	*Arthropoda virgo.*
L. helvolus Nitzsch in Burmeister.	3 ? imm.	1	*Scolopax rusticola.*
L. heterogrammicus Nitzsch in Giebel.	9 ♀♀, 1 ♂.	5	*Perdix chukar.* *Perdix cinerea.* *Perdix balteata.* *Ortyx virginiana* ‡.
L. heterographus Nitzsch in Giebel.	13 ♀♀, 6 ♂♂.	9	*Ardea stellaris.* *Gallophasis cuvieri.* *Perdix rubra.* *Turacus giganteus.* *Phasianus pictus* (Celebes).
L. heterographus var. *major* Piaget.	1 ♀, 1 ♂.	1	*Pavo specifer.*
L. inæqualis Piaget	2 ♀♀, 2 ♂♂.	2	*Megapodium rubripes* var. *duperreyi.* *Megapodium rubripes* var. *bernsteni.*
L. intermedius Piaget	3 ♀♀, 4 ♂♂.	4	*Euplocamus ignitus.* *Euplocamus pyronotus.*
L. interruptofasciatum Piaget	1 ♀, 3 ♂♂.	2	*Eclectus puniceus.*
L. introductum Kellogg	2 ? ♀♀.	1	*Phasianus nycthemerus* (California).
L. jejunus Nitzsch in Denny	6 ♀♀, 5 ♂♂, 1 imm.	6	*Cygnus nigricollis.* *Cygnus buccinator.* *Anser ægyptiacus.* *Anas penelope.* *Brenta jubata.*

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* The male only is described in the original description, but there is no male in the collection.

† ? Not published.

‡ The specimens from this host are referred to as a var. in the 'Monograph' (see 'Les Pédiculines,' Suppl., 1885, p. 69), but there is no such indication on the label.

Species.	No. of specimens in B.M.	No. of slides.	Hosts.
L. lacteus Giebel	2 ♀♀, 1 ♂.	1	*Anas tadorna.*
L. latus Piaget	2 ♀♀, 1 ♂.	1	*Rhea americana.*
L. latifasciatus Piaget	1 ♀, 1 ♂.	1	*Megapodium freycineti.*
L. leucopygus Nitzsch in Burmeister.	3 ♀♀, 2 ♂♂.	2	*Ardea cinerea.* *Herodias n-hollandiæ.*
L. leucopygus var. *minor* Piaget	3 ♀♀, 1 ♂.	2	*Ardea purpurea.*
L. leucopygus var. *stellaris* ? Piaget.	1 ♀, 1 ♂.	1	*Ardea stellaris.*
L. longus Piaget	2 ♀♀, 4 ♂♂.	3	*Tragopan temmincki.* *Tragopan satyrus.* *Cercicornis megalocephalus.*
L. longiceps Rudow	2 ♀♀.	2	*Carpophaga paulinæ.* *Phasianus pictus.*
L. longicornis Piaget	5 ♀♀, 3 ♂♂.	4	*Phalacrocorax carbo.* *Sula fusca.* *Plotus melanogaster.*
L. longipes Piaget	1 ♂.	1	*Tinamus obsoletus.*
L. luridus Nitzsch	2 ♀♀, 1 imm.	3	*Gallinula chloropus* (Sumatra). *Fulica atra.* *Anas arcuata.*
L. macrocephalus Kellogg	2 ♀♀.	1	*Chordeiles virginianus.*
L. macroceros Piaget	2 ♀♀.	1	*Milvago pezoporus.*
L. maculatus (*versicolor*) Nitzsch in Giebel.	2 ♀♀.	1	*Ciconia nigra.*
L. marginellus Piagot	4 ♀♀, 4 ♂♂.	4	*Bernicla magellanica.*
L. maximum Rudow	3 ♀♀, 2 ♂♂.	3	*Grus paradisea.* *Grus pavonina.*
L. megalops Piaget	2 ♀♀.	2	*Cryptonyx coronatus.*
L. mesopelius Nitzsch in Giebel	17 ♀♀, 7 ♂♂.	13	*Phasianus pictus.* *Phasianus nycthemerus.* *Phasianus colchicus.*
L. monilis Nitzsch in Giebel	1 ♀ *.	1	*Neophron percnopterus.*
L. mutabilis Piaget	1 ♀, 1 ♂.	1	*Procellaria glacialis.*
L. nigrolineatus Piaget	2 ♀♀.	1	*Hemipodius dussumieri.*
L. ochraceus Nitzsch in Giebel	4 ♀♀, 4 ♂♂.	4	*Tetrao urogallus.* *Tetrao urogallus* (Siberia).
L. parretus Piaget †	1 ♂.	1	*Buceros bicornis.*
L. parumsetosum Piaget	1 ♀.	1	*Rhynchea variegata* (Sumatra).
L. parviceps Piaget	1 ♀, 1 ♂.	1	*Sterna hirundo.*
L. platalearum Giebel	4 ♀♀, 5 ♂♂	4	*Platalea leucorodia.*
L. platyclypeatus Piaget	1 ♀.	1	*Perdix* sp. ? (Celebes).
L. polytrapezius Nitzsch in Burmeister.	4 ♀♀, 5 ♂♂.	5	*Palamedes chavaria.* *Meleagris gallopavo.*
L. pullatus Nitzsch in Giebel	9 ♀♀, 7 ♂♂.	8	*Sula bassana.* *Sula fuscus.* *Sula alba.*

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* In Tijd. v. Ent., 1888, p. 155, pl. 3, fig. 8, there is a description and figure of a male, but there is no male in the collection.

† ? Not published.

Species.	No. of specimens in B.M.	No. of slides.	Hosts.
L. quadrimaculatus Piaget	13 ♀♀, 8 ♂♂.	10	*Rhea americana.* *Struthio camelus.* *Aquila fulva.*
L. quadripustulatus Nitzsch in Burmeister.	8 ♀♀, 6 ♂♂, 4 imm.	8	*Aquila fulva.* *Vultur rupetta.*
L. raphidius Nitzsch in Giebel	2 ♀♀, 2 ♂♂.	2	*Ibis cristata.*
L. rotundatus Piaget	1 ♂.	1	*Podou senegalensis.*
L. rubrifasciatus Piaget	9 ♀♀, 3 ♂♂.	5	*Tinamus solitarius.* *Oreoperdix crudigularis.*
L. saturatior Piaget	1 ♀.	1	*Tochus erythropterus.*
L. secretarius Giebel	2 ♀♀, 3 ♂♂.	3	*Helotarsus caudatus.* *Gypogeranus serpentarius.*
L. setosus Piaget	8 ♀♀, 3 ♂♂, 3 imm.	7	*Phalacrocorax carbo.* *Carbo africanus.* *Graculus pygmæus.* *Plotus levaillanti.* *Graculus sulcirostris.*
L. setosus var. *brevisignata* Piaget.	2 ♀♀, 2 ♂♂.	2	*Carbo javanicus.*
L. signatus Piaget	3 ♀♀, 2 ♂♂.	2	*Anastomus lamelligerus.*
L. signatus var. *atrata* Piaget	1 ♂.	1	*Ardea calidonica* (Celebes).
L. signatus var. *pallida* Piaget	2 ♀♀, 2 ♂♂.	2	*Ardea abolineata.*
L. squalidus Nitzsch in Denny	7 ♀♀, 6 ♂♂.	7	*Anas* sp. ? *Anas acuta.* *Anas clypeata.* *Anas punctata.* *Anas rutila.* *Dendromissa sponsa* (Visconsin).
L. squalidus var. *major* Piaget	2 ♀♀.	1	*Anas gibberifrons* (Celebes).
L. squalidus var. *colorata* Piaget.	1 ♀ *.	1	*Anas melanotus* (Madagascar).
L. squalidus var. *atrata* Piaget †	2 ♀♀, 1 ♂.	1	*Cygnus atrata.*
L. subangusticeps Piaget	2 ♀♀.	1	*Procellaria leachii.*
L. subsetosus Piaget	4 ♀♀, 6 ♂♂, 3 imm.	6	*Phalacrocorax* sp. ? (Madagascar). *Graculus melanotus.* *Graculus africanus.*
L. subsignatus Giebel	14 ♀♀, 11 ♂♂.	11	*Phœnicopterus antiquorum.* *Phœnicopterus ruber.*
L. taurus Nitzsch in Giebel	5 ♀♀, 5 ♂♂.	5	*Diomedea exulans.* " Sur un albatros."
L. temporalis Nitzsch in Denny	3 ♀♀, 3 ♂♂.	3	*Mergus merganser.*
L. thoracicus Piaget	3 ♀♀, 2 ♂♂.	2	*Anas ratjah.*
L. trabeculus Piaget	1 ♀.	1	*Psitta* sp. ?
L. tricolor Piaget	1 ♀, 1 ♂.	1	*Diomedea fuliginosa.*
L. teade Piaget	1 ♀, 1 ♂.	1	*Megacephalon calao.*
L. tuberculatus Piaget	1 ♀.	1	*Procellaria glacialis.*
L. turmalis Nitzsch in Denny	4 ♀♀, 3 ♂♂.	3	*Otis tarda.*
L. uncinatus Piaget	1 ♀, 1 ♂.	1	*Cryptonyx coronatus.*
L. unicolor Piaget	4 ♀♀, 3 ♂♂.	3	*Perdix javanica.*

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* A male is mentioned in the 'Monograph,' but there is no male in the collection.

† This is apparently the var. *antennata* referred to in the 'Monograph.'

Species.	No. of specimens in B.M.	No. of slides.	Hosts.
L. variabilis Nitzsch in Burmeister.	17 ♀♀, 7 ♂♂.	14	*Lophophorus impeyanus.* *Gallus furcatus.* *Fringilla chloris.* *Sterna nigra.* *Euplocamus cuvieri.* *Colymba phasianella.* *Gallus domesticus.* *Pavo spicifer.*
L. variabilis var. *	1 ♀, 1 ♂.	1	*Gallus bankiva.*
L. variabilis var. *	4 ♀♀, 3 ♂♂.	3	*Gallophasis cuvieri.* *Gallus bankiva.*
L. variabilis var. *	1 ♀, 1 ♂.	1	*Phasianus reevesii.*
L. variabilis var. *	6 ♀♀.	3	*Francolinus capensis.*
L. variabilis var. ? *	3 ♀♀, 3 ♂♂.	3	*Euplocamus pyronotus.* *Phasianus pictus.*
L. versicolor Nitzsch in Burmeister.	5 ♀♀, 2 ♂♂.	3	*Ciconia alba.* *Ciconia nigra.*
L. versicolor var. *castanea* Piaget .	2 ♀♀.	1	*Ciconia leucocephala.*
L. zonatus Piaget...............	?	?	*Buceros nepalensis.*

[To be continued.]

XXXVIII.—*On* Storeus *and* Deretiodes (*Coleoptera*, Curculionidæ) *in Fiji.* By Elwood C. Zimmerman, Bernice P. Bishop Museum, Honolulu, T.H.

Genus Storeus Schönh.

Heretofore there have been three species of *Storeus* known from Fiji. They were described by Lea ('Queensland Museum Memoirs,' vol. ix. pt. 1, pp. 59–61, 1927). The genus belongs to the tribe Tychiini, and its members can be recognized by their appendiculate tarsal claws, by the conspicuous and peculiar foveæ on the sides of the prosternum anterior to the coxæ, and by their rather distinct prosternal canal. Most of the known species have been described from eastern Australia.

Key to the Fijian Species.

1. Scaling on the elytra predominantly black; at least the first, third, and fifth intervals with erect or suberect setæ, those on interval 1 longest and most conspicuous and

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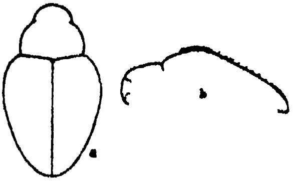
* The vars. as given here are not in the 'Monograph.'

forming a loose cluster at the summit of the elytra	*gibber*, sp. n.
Scaling on the elytra predominantly yellowish or fawn-coloured	2.
2. Elytra with a common, transverse, dark fascia at about the middle, extending across the first three intervals of each elytron, usually shallowly V-shaped	*minimus* Lea.
Elytra without a dark fascia	3.
3. Scaling on the elytra predominantly yellow with a golden sheen, with small, condensed patches of white scales; intervals without erect setæ; males with long hair on the inner edges of the femora and tibiæ; length 3–3·5 mm.	*aurifer* Lea.
Scaling on the elytra predominantly fawn-coloured, variegated with whitish and brownish spots; at least some of the intervals with a few short, erect setæ; length 2·5 mm.	*inermis* Lea.

Storeus gibber, sp. n. (Figs. *a* & *b*.)

Male.—Derm black, with the pronotum, head, rostrum, abdomen, and appendages diluted with red; rather densely squamose above, the scaling predominantly black; head with mostly pale scales; pronotum with numerous pale to white scales among the black; elytra with a small patch of white scales on each shoulder, a common, small, sutural white patch at about the middle, and a comparatively large white patch at the apex of each elytron, otherwise with few pale scales; scaling on the legs mixed; scaling pale below.



Storeus gibber, sp. n.
a, lateral outline; *b*, dorsal outline.

Head coarsely reticulate and almost impunctate; interocular area only about one-half as broad as the base of the rostrum. *Rostrum* as long as the pronotum, almost straight in its basal two-thirds, but distinctly bent at its apical third; rather coarsely punctate throughout and with five dorsal carinæ which terminate at the antennæ which are inserted in the apical third. *Antennæ* with the scape about as long as the funicle excluding the apical half of the club; first funicular segment as long as the following four segments together, second segment longer than the third, the others successively broader, the seventh slightly longer than the sixth; club as long as the preceding six segments. *Prothorax* distinctly broader than long (2·2 : 1·7), slightly rounded on the sides to about the apical third, and there strongly constricted, the apical third appearing subtubular from above; the subapical constriction not continued across the dorsum, the longitudinal outline of which is gently and evenly convex; base slightly sinuous; evenly punctate above, the punctures small and round, separated by distances about equal to their own diameters; with erect setæ near the apex, the setæ otherwise prostrate; the fovea on the sides large and deep, continuous with the subapical constriction, with an opening both on the side and below. *Elytra* almost cordate, five-eighths longer than the prothorax, slightly more than three-fourths as broad as long, base broadly emarginate, broadly arcuate on the sides from base to apex, broadest at about the basal third; the longitudinal dorsal outline rising rather rapidly from the base to reach its summit at about the basal third, and thence slanting downward in almost a straight line to just before the apex, where the contour becomes almost vertical to the apex; scales small and dense; intervals broad and flat, the first with an elongate cluster of erect setæ at the summit of the elytra and with a single row of erect or slanting setæ to the apex; intervals 3 and 5 with single rows of slanting setæ, the setæ on interval 5 fewer in number and less conspicuous than those on 4; striæ not well marked, their punctures larger and most distinct near the base. *Legs* with scattered setiform scales and slender setæ; femora grooved and edentate. *Sternum* with the prosternal canal broad and distinct; the fore coxæ large, flattened and squamose on their inner sides; intercoxal process of the mesosternum conspicuous, flattened, with a few punctures bearing prostrate setiform scales; metasternum coarsely punctured throughout, the punctures bearing setiform scales. *Venter* flattened, reticulate, with distinct punctures near the base of the first ventrite or near the sides only; with a few scattered setiform scales; the first ventrite approximately as long as 2+3, 2 about as long as 3+4, which are equal, 5 distinctly longer than 3+4. Length 2·2 mm.; breadth 1·3 mm.

Fiji. Holotype male from Labasa, collected by Mr. R. Veitch, July 1921, to be deposited in the British Museum; it was sent for study by Sir Guy A. K. Marshall.

The small size and black scaling of this species, together with its "hunched-back" elytra with the elongate cluster of black setæ, will readily distinguish this species from all the other described Fijian species.

Genus DERETIODES Mshl.

In my paper "On Lea's Fijian *Deretiosus*" (Bishop Mus. Occ. Papers, vol. xiii. no. 7, 1937) I recorded the genus *Deretiodes* Marshall, 1931, from Fiji for the first time, and listed the two species of the genus incorrectly described by Lea in *Deretiosus* Pascoe, 1871. Since the writing of that paper Sir Guy Marshall has sent me from the Imperial Institute of Entomology a remarkable new species of the genus, which is described below.

The genus *Deretiodes* is yet known only from Samoa, where one species is recorded, and from Fiji, where three species have been found. The three Fijian species may be separated as follows:—

Key to the Fijian Deretiodes.

1. Elytral interval 2 with fascicles; scutellum conspicuously white, surrounded by dark brown scales; apex of the pronotum with numerous, stout, erect, scattered setæ on either side of the middle that are not condensed into fascicles; posterior third of the elytra predominantly white, with a black patch on the suture .... *scutellaris* (Lea).

Elytral interval 2 without fascicles; scutellum of the same general colour as its surroundings .... 2.

2. Elytra parallel-sided in the basal two-thirds, with a common white V in the middle, the scutellar area not conspicuously darker than the surrounding scaling, the setæ stout and peg-like, not long and spike-like, those on the legs comparatively short and not bristling .... *muticus* (Lea).

Elytra rather ovoid, the humeri not prominently rectangular, bristling with long, erect, spike-like setæ, scutellar area from the base to the hind margins of the large subbasal fascicle on interval 3 extending from the first to the third intervals, very dark brown, almost black, the declivity largely clothed with similarly coloured scales, elsewhere pale fawn-coloured, the result being a broad antemedian, transverse pale fascia across the elytra; disk of the prothorax almost black; legs conspicuously bristling with setæ .... *hispidus*, sp. n.

Deretiodes hispidus, sp. n.

Male.—Derm yellowish to reddish brown, concealed by dense scaling; head and rostrum with brown scales; prothorax brown on the sides, with the disk largely occupied by a very dark brown or black vase-shaped area from the base to the apex, the dark area beginning before elytral interval 3 and including the median fascicles, with a few pale scales at the middle of the apex and some paler scaling on either side of the dark area before interval 4, the setæ pale brown to almost black; elytra predominantly fawn-coloured, with the scutellar area from the suture across the first three intervals and from the base to the apex of the subbasal fascicles of the third intervals very dark brown, as the prothoracic disk, and continuous with it, the area thus formed subquadrate and very conspicuous, the scaling on the declivity from the middle to the apex mostly very dark brown, but with some pale patches on the sides and toward the apex, the scaling between the dark scutellar and declivital areas on the disk paler than on the sides and making a broad, pale, transverse fascia that is very conspicuous to the unaided eye; legs fawn-coloured, with the femora banded with dark brown; scaling below fawn-coloured.

Head with the scaling very dense, the interocular area depressed. *Rostrum* finely carinate from the base to the antennæ, squamose nearly to the antennæ, finely and densely punctate from the antennæ to the apex, the punctures bearing short, fine setæ. *Antennæ* with the scape about as long as the funicle excluding the club; first funicular segment slightly longer than the second and almost twice as broad, the second not stouter than the third, as long as 3 plus one half of 4, 3 longer than 4, 4 to 6 successively larger; club not quite as long as the preceding four segments together. *Prothorax* about as long as broad, base subtruncate, slightly arcuate on the sides from the base to beyond the middle and thence distinctly constricted, the constriction continued across the dorsum and interrupting the dorsal contour; the fascicles reduced in size and not well developed, the apical pair loose and ill defined, made up of several pustules surrounding longer, erect setæ, the lateral pair situated slightly in front of the discal pair and not quite so well developed as the discal pair, hardly larger than the pustules back of the subbasal fascicle on interval 3, with several long, erect setæ arising from small pustules at the sides. *Scutellum* protuberant and strongly convex. *Elytra* rather ovoid, slightly more than three-fourths as broad as long, somewhat more than twice as long as the prothorax, base slightly sinuous, arcuate on the sides from base to apex, the setæ long, narrow, erect, and giving a conspicuous bristling appearance, the pustules surrounding the setæ larger on the disk, inconspicuous at the apex; strial punctures showing slightly through the scaling; first interval with eight or nine setæ behind the dark scutellar area, second interval without setæ, third interval with a very conspicuous subbasal fascicle and thence with pustules to the apex; the even numbered intervals usually without setæ, the others with setæ and pustules. *Legs* densely squamose, bristling with comparatively long erect setæ. *Sternum* with the pectoral canal terminating in a slightly overarched cavity in the metasternum at the posterior margin of the mesocoxæ; the metasternum concave in the middle, emarginate behind, not quite as long as a metacoxa between the mid and hind coxæ. *Venter* very densely squamose, with small scattered setæ, not conspicuously punctate, the sutures straight; the intercoxal process of the first ventrite slightly angulate in front, concave in the male. Length 3·2 mm.; breadth 1·6 mm.

Fiji, Taveuni. Holotype male, to be deposited in the British Museum, collected by Dr. Sylvester Evans, October 18, 1924 (the locality written on the label is evidently " Delai "). The number " 2190–24 " is attached.

This is perhaps the most distinct and easily recognized species of the genus. The colour-pattern, with the dark prothoracic disk, the dark scutellar area followed by the broad pale fascia, and the largely black apical half of the elytra, together with its conspicuous setæ, are characteristics not to be confused with any of the other known species.

XXXIX.—*The Mallophaga parasitic on* Musophagidæ (*Plantain-eaters*).—I. By GORDON B. THOMPSON.

[Plate XII.]

THE Musophagidæ or Plantain-eaters etc. are confined to the African continent. In the present classification of birds they are placed between the Cuculidæ (Cuckoos) and Psittacidæ (Parrots).

Five species of Mallophaga have so far been described from this family of birds. They may be listed as follows:—

1. *Colpocephalum scleroderma* Ewing.

Proc. Biol. Soc. Wash. 1930, xlui. pp. 127-128.

Type-host.—Musophaga rossæ Gould (*Musophaga rossæ*, Belgian Congo, Ituri Forest).

2. *Colpocephalum subrotundum* Giebel.

Insecta Epizoa, Leipzig, 1874, p. 266.

Type-host.—Musophaga violacea Isert. (*Musophaga violacea*—dry skin).

3. *Philopterus acuminatus* (Piaget).

Tijdschr. Ent. 1888, xxxi. pp. 147-148, pl. iii. fig. 1.

Type-host.—Turacus persa (Linn.) subsp. ? (*Turacus purpureus*).

4. *Esthiopterum distinctum* Harrison.

(Nom. nov. for *Esthiopterum dispar* (Piaget), Les Pédiculines, Suppl., Leiden, 1885, pp. 79-80, pl. viii. fig. 7.)
Parasitology, 1916, ix. p. 133.

Type-host.—Turacus m. macrorhynchus (Fraser) (*Corythus macrorhynchus* [Liberia]).

5. *Esthiopterum opimum* (Piaget).

Les Pédiculines, Suppl., Leiden, 1885, pp. 78-79, pl. viii. fig. 6.

Type-host.—Corythæola cristata (Vieillot) (*Turacus giganteum* [Leiden Mus.]).

Having received a considerable number of specimens of Mallophaga from a number of different species of Musophagidæ for study, this paper is written as the first of a series in which I hope to deal with all the species parasitizing this interesting group of birds. I wish to record my very best thanks to Mr. G. H. E. Hopkins for the opportunity of studying this material and to Dr. J. W. Shackle for the excellent photographs.

For the first contribution I am taking the species described by Ewing (1930). The description of this species was based on a single male, and the unique type is in the United States National Museum Collection, Washington (Cat. no. 42851). I have therefore been unable to compare my specimens with the type, but since they agree so perfectly with Ewing's description I feel confident that they represent that species.

A new genus is here proposed for the reception of Ewing's species and another closely allied species here described as new. The new genus may be described as follows :—

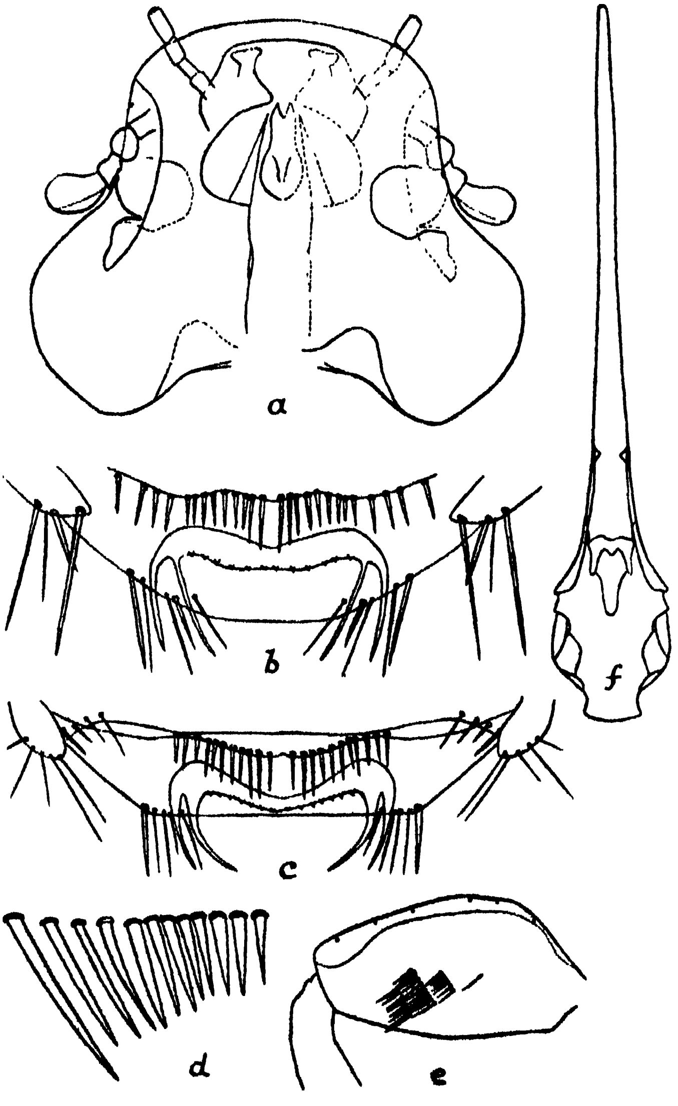
TURACŒCA, gen. nov.

Monoponidæ of small size, pale coloured, heavily sclerotized along the outer margins of the legs and abdomen, with combs of spines (see fig. *d*) on the third, fourth, and fifth or on the third and fourth abdominal sternites, and two or three combs of spines (see fig. *e*) on the ventral surface of the posterior femora.

Head broad, somewhat angular, wider than long, temples very prominent. The fourth and part of the third segment of the palpi project beyond the anterior portion of the head (see fig. *a*).

Thorax three-segmented; prothorax less than half the length of the head and more than twice as wide as long; mesothorax small, distinct, barely half the size of the metathorax; metathorax large, being almost as wide posteriorly as the greatest width of the abdomen, with a few short spines directly outwards and posteriorly in the posterior lateral angles.

Abdomen almost rectangular in the female, somewhat swollen in the male, narrowing posteriorly, abruptly; roughly a third longer than broad; segments clearly defined; paratergites heavily sclerotized and bearing a few long, stout setæ in their posterior lateral angles.



a. Head of *T. scleroderma* (Ewing) (setæ not shown). b. Anterior part of abdomen of female of *T. bedfordi*, sp. n. c. Anterior part of abdomen of female of *T. scleroderma* (Ewing). d. Comb of spines on fifth sternite of *T. scleroderma* (Ewing). e. Hind femora of *T. scleroderma* (Ewing). f. Male genitalia of *T. scleroderma* (Ewing) (the preputial sac is not shown). (All figures drawn to the same scale except *d*.)

There is slight sexual dimorphism in the abdominal segments—in the female the first abdominal segment is long and wider in the middle than at the sides, the second segment is less than half as long as the first, whereas in the male the first and second abdominal segments are roughly the same size. The pleurites and tergites appear to be more heavily sclerotized in the females.

Male genitalia consisting of a very long, slender, basal plate extending to about three-quarters of the length of the abdomen; *Colpocephalum*-type (see fig. *f*). A preputial sac is present (not shown in drawing) which bears minute "teeth."

Female terminalia very distinct and quite unlike any other species known to me (see figs. *b*, *c*).

The chætotaxy of the terminal abdominal segments is very characteristic in both sexes.

Genotype.—*Colpocephalum scleroderma* Ewing.

Type-host.—*Musophaga rossæ* Gould (see below).

This genus is related to *Cuculiphilus* (Uchida, 1926), which contains species parasitic on cuckoos. This is interesting in view of the relationship of the two families of birds (see above).

Turacœca scleroderma (Ewing).
(See Pl. XII. and figs. *a*, *c*, *d*, & *e*.)

Ewing gives *Musophaga rossæ* as the type-host of this species. The specimens which I have before me, and which I consider as representing his species, were all collected from *Corythæola c. cristata* (Vieill.). It seems probable that the host of Ewing's species may have been incorrectly stated, especially in view of the fact that the single female which I have seen from *Musophaga violacea rossæ* Gould is a different species though congeneric. Dr. Jos. Bequaert, from whom Ewing received his single specimen, is unable to throw any light on the identity of the host—he admits the possibility of carelessness on the part of the collector of the parasite in giving the correct host name.

Specimens examined.—All specimens off *Corythæola c. cristata* (Vieillot), Blue or Giant Plantain-eater, from Uganda.

2 ♂♂, Kampala, Munyonyo, 5. x. 1932 (*G. H. E. H.*).
1 ♂, Kampala, Munyonyo, 7. x. 1932 (*G. H. E. H.*).
2 ♀♀, M'buya, 2. x. 1932 (*T. W. C.*).

3 ♀♀, 8 ♂♂, near Kampala, Namanve, 9. ix. 1932 (*T. W. C.*).

1 ♂, 2 ♀♀, Kampala–Entebbe Road, M. 9, 3. xi. 1932 (*G. H. E. H.*).

4 ♂♂, 3 ♀♀, near Kampala, 3. ix. 1933 (*G. H. E. H.*).

Length.—♂ (on slide) 1·8 mm.; *greatest breadth* ·7 mm. ♀ (on slide) 1·9 mm.; *greatest breadth* ·8 mm.

The photographs of the male and female together with the text-figures should be sufficient to render the recognition of this species an easy matter.

Turacœca bedfordi, sp. n.

(See fig. *b*.)

Type-host.—*Gymnoschizorhis leopoldi centralis* Neumann.

This species comes very close to *T. scleroderma* (Ewing). I have been unable to find any differences in the male genitalia. The main differences are as follows:—It is a smaller species; the combs of spines on the sternites are only present on the third and fourth; the fifth sternite bears approximately four very short spines instead of a comb; the terminal abdominal segments of both the male and female are not almost surrounded by the eighth segment as in *T. scleroderma* (Ewing), but are normal as the anterior segments; only two combs of spines appear to be present on the ventral surface of the posterior femora.

Specimens examined.—1 ♂ holotype, 1 ♀ allotype, 2 ♂♂ and 4 ♀♀ paratypes off the type-host, from Uganda, Mbarara–Masaka Road, 8. vii. 1934 & 9. ix. 1934 (*G. H. E. H.*).

1 ♀ paratype off *Musophaga violacea rossæ* Gould (Violet Plantain-eater), Uganda, Nabugabo, 9. ix. 1934 (*G. H. E. H.*).

1 ♀ paratype off *Ruwenzorius j. johnstoni* (Ruwenzori Plantain-eater), Uganda, Nymabitaba, 3700 ft., 7. viii. 1933 (*W. J. E.*).

Length.—♂ (on slide) 1·3 mm.; *greatest breadth* ·6 mm. ♀ (on slide) 1·6 mm.; *greatest breadth* ·7 mm.

EXPLANATION OF PLATE XII.

Fig. 1. *Turacœca scleroderma* (Ewing). ♀.
Fig. 2. Ditto. ♂.

× 25 approx.

XL.—Hermes dubitatus *and* Hermes diversus *Walker* (Sialidæ, *Megaloptera*). By D. E. Kimmins, Department of Entomology, British Museum (Natural History).

[Plate XIII.]

These two species were described in the 'List of the Specimens of Neuropterous Insects in the collection of the British Museum,' Part 2, 1853; *H. dubitatus* on page 204, from a single example without locality, and *H. diversus* on p. 206, from two examples from New Zealand. In 1861 Hagen transferred *H. dubitatus* to the synonymy of *Chauliodes californicus* Walker, and in this he was followed by McLachlan, 1867, Journ. Linn. Soc., Zool. ix. p. 260. Two years later, in the Ann. & Mag. Nat. Hist. (4) iv. p. 37. after seeing further specimens of *H. diversus*, McLachlan revised his opinion, considering *dubitatus* to be identical with *diversus*, giving priority to the latter name and transferring it to the genus *Chauliodes*. Hudson, 1904, in his 'New Zealand Neuroptera,' p. 45, accepts this synonymy. Van der Weele examined Walker's types in 1906, and in 1910, Coll. Selys. v. pp. 46–7, stated that he considered McLachlan's synonymy to be correct, but that he gave the name *dubitatus* priority over *diversus*, making *dubitatus* the type of his genus *Archichauliodes*. This genus was briefly described in 1909, Notes Leyden Mus. xxx. p. 258.

During the past four or five years Mr. G. V. Hudson has presented to the British Museum numerous fine specimens of New Zealand Neuroptera (*s. l.*), and amongst them several examples of *Archichauliodes*. This series has led me to make a further comparison of the Walker types of *H. dubitatus* and *H. diversus*, and I am now convinced that the two are not only specifically, but generically distinct. Furthermore, all the New Zealand examples that I have examined should be referred to *Archichauliodes diversus* (Walker). *Hermes dubitatus* Walker thus remains known to me only by the female type, but it is in many characters distinct from *A. diversus*. The wings (Pl. XIII.) differ both in shape and venation; those of *diversus* are noticeably narrower:

(*a*) The first cross-vein between R_1 and *Rs* is inclined basally, not apically as in *dubitatus*.

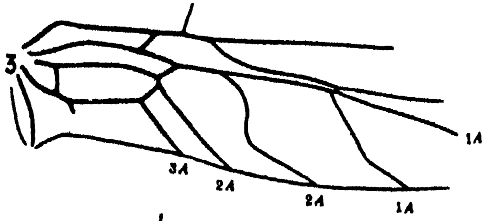
(*b*) 1 A in anterior wing connected to the upper branch of 2 A by a cross-vein (confluent for a short distance in *dubitatus*) (figs. 1, 3).

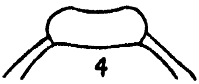
(*c*) R_3 and R_4 in both wings having separate origins on *Rs* (in *dubitatus* with a long common stem).

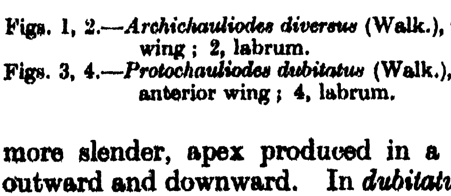
(*d*) Terminal fork of *Cu* 1 short (long in *dubitatus*).

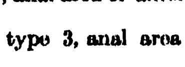
(*e*) M_1 and M_2 fused in posterior wing (separate in *dubitatus*).

The markings of the anterior wing of *A. diversus* exhibit a tendency to form transverse bands and the basal costal area of the posterior wing is without markings. Apical margin of the labrum (figs. 2, 4) in *diversus* convex, in *dubitatus* slightly concave. Anal cerci of the ♀ (figs. 5, 6) more slender, apex produced in a short finger curving outward and downward. In *dubitatus* the cerci (figs. 7, 8) are stouter, quadrate from the side, with the upper apical angle produced in a short blunt cone. Valves of the ovipositor in *dubitatus* have been destroyed by insect pests, but the cerci are undamaged. The difference in the form of the anal cerci was noticeable in dry examples, but was verified by clearing in KOH.





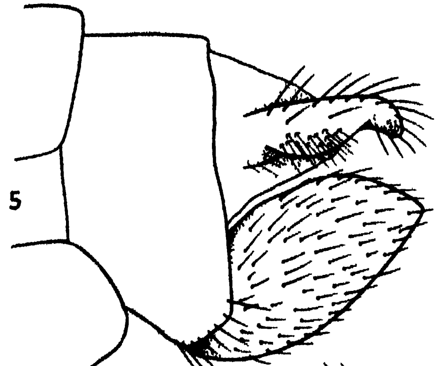




Figs. 1, 2.—*Archichauliodes diversus* (Walk.), ♀. 1, anal area of anterior wing; 2, labrum.

Figs. 3, 4.—*Protochauliodes dubitatus* (Walk.), ♀. type 3, anal area of anterior wing; 4, labrum.

On the venational characters listed above (with the exception of "*a*") Walker's *dubitatus* should be transferred to the genus *Protochauliodes* Weele, which has a S. American distribution. As there is no indication of the locality of *dubitatus* Walker, there appear to be just as good reasons for believing it to be South American as there are for assuming it to be of New Zealand origin.



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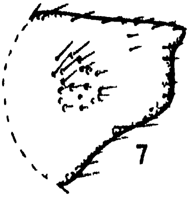

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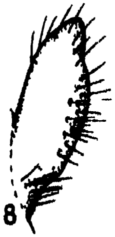

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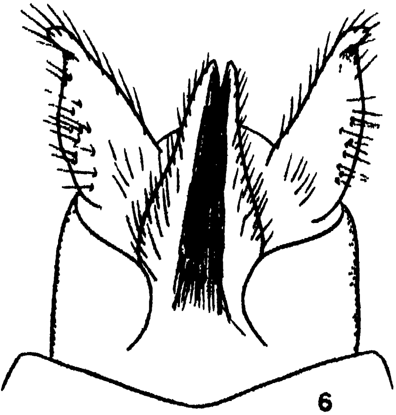

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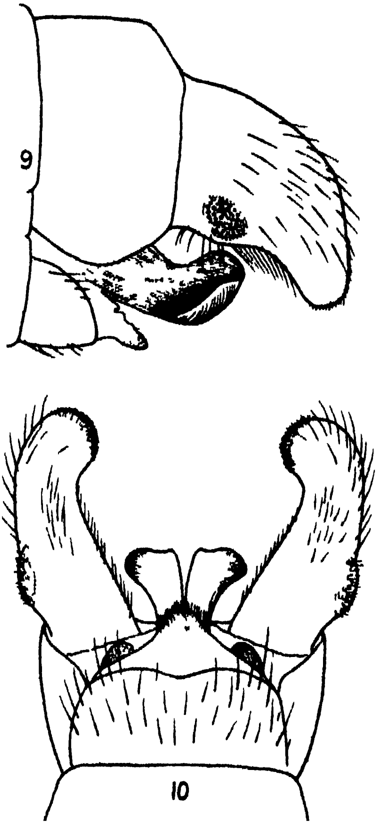
Figs. 5, 6.—*Archichauliodes diversus* (Walk.), ♀. 5, apex of abdomen from side; 6, same from beneath.
Figs. 7, 8.—*Protochauliodes dubitatus* (Walk.), ♀. type 7, left anal cercus from side; 8, right anal cercus from beneath.

Van der Weele in erecting his genus *Archichauliodes* cites as genotype "*Ch. dubitatus* Walker from New Zealand," his reference to the locality being obviously based on the assumption that *dubitatus* and *diversus* were synonymous. Such has been shown to be incorrect, and it is evident from his description of *dubitatus* in the Selysian monograph that he had before him examples of *diversus* and not *dubitatus*, as he mentions the transverse banding of the wings and the absence of speckles in the costal area of the posterior wing. I propose, therefore,



Figs. 9, 10.—*Archichauliodes diversus* (Walk.), ♂ type. 9, apex of abdomen from side; 10, same from side.

that as Van der Weele certainly intended the genotype of *Archichauliodes* to be the New Zealand species, it should be quoted as :—

Archichauliodes Weele, 1909, Notes Leyden Mus. xxx. p. 258. Genotype :—*Hermes diversus* Walker (=*Archichauliodes dubitatus* Weele partim *nec* Walker).

This course will avoid the necessity for sinking *Protochauliodes* as a synonym of *Archichauliodes* and creating a new name for *diversus* and *guttiferus* Walker, a course which I consider both unnecessary and undesirable.

Of the two examples of *diversus* listed by Walker, I select as *type* the male (specimen " *b* "), bearing a round label " N. Zeald." 48–80, and presented by Dr. J. Hooker. Specimen " *a* " is a female, and is the one whose measurements are given by Walker. I am figuring (figs. 9, 10) the genitalia of the ♂ type (after clearing in KOH), which agree reasonably with the figure given by Van der Weele of a ♂ in the Brussels Museum, and which, from his description, belonged to the true *diversus*.

EXPLANATION OF PLATE XIII.

A. Wings of *Archichauliodes diversus* (Walker), ♀, South Karori. × 2·2.
B. Wings of *Protochauliodes dubitatus* (Walker, ♀ type, × 2·2.

XLI.—*Some new Australian Sawflies of the Subfamily* Euryinæ (Pergidæ) (*Hymenoptera, Symphyta*).

By Robert B. Benson, M.A., Department of Entomology, British Museum (Natural History).

The forms dealt with in this paper are to be added to the revision I published in 1934 and the additions made in 1935.

The placing of this subfamily in the Pergidæ and its relation to the other subfamilies will be dealt with in a forthcoming paper on the classification of sawflies.

In addition to the characters mentioned in my key (1934, p. 464) for separating the genera, several others have more recently been found useful, especially as occasionally the venational character used in couplet 2 is doubtful or obscured by the folding of the wings.

If couplet 2 were therefore abolished the genera *Clarissa* W. E. Kirby, *Diphamorphos* Rohwer, and *Polyclonus* W. F. Kirby (which I am transferring to this subfamily from the Perreyiinæ) are separated from the rest on the form of the apical cell in the hind wing (*cf.* fig. 2, 1934). These three genera can be separated thus :—

Antenna inserted very close to the clypeus at a distance less than the 2 basal segments of the antenna ; labial palp clavate and broader than the maxillary palp ; cervical sclerites not meeting in front.
- Antenna serrate below in ♀ and with long rami below in the ♂. . *Polyclonus* W. F. Kirby.
- Antenna simple. . . . . *Diphamorphos* Rohwer.

Antenna inserted further from the clypeus than the length of the 2 basal segments ; labial palp simple, not broader than maxillary palp ; cervical sclerites meeting in front . . . . *Clarissa* W. F. Kirby.

Warra Benson, with a large apical cell to the hind wing, can be separated at once from *Neoeurys* Rohwer by its subclavate antenna and shorter tarsal segments (in *Warra* the hind tarsi together are clearly shorter then the hind tibia, 4 : 6 in ♀ and 5 : 6 in ♂). *Neoeurys* differs from all other genera in the subfamily in that the length of the hind tarsi together are equal to the hind tibia.

Clarissa W. F. Kirby is alone in this subfamily in having the cervical sclerites meeting in front.

Eurys chloe, sp. n.

Colour.—♂♀. Metallic green ; legs except the coxæ red ; piceous are the mouth-parts, antennæ, apices of coxæ, bases of femora, and outer side of tarsi. *Wings* hyaline ; stigma and venation piceous.

Length 4·5 mm.

Structure, except for its small size (4·5 instead of 7–11 mm. long) and 8-segmented antenna (instead of 10–11-segmented), but including mouth-parts and genitalia (see Benson 1934, figs. 4 and 5), as in *Eurys lætus* Westwood.

NEW SOUTH WALES, Mt. Kosciusko, 5000 ft., 1 ♂ (holotype), 1 ♀, 10. xii. 1931 (*L. F. Graham*).

The holotype is returned to the Canberra Museum; the ♀, which is rather damaged, is retained in the British Museum. This may be only a high-mountain form of *E. lætus* Westwood, from which it can be distinguished by the dark labrum, the hyaline instead of slightly infuscate wings, the very small size, and short 8-segmented antennæ.

E. bella Rohwer, which has mostly black hind femora, and *E. nitens* W. F. Kirby, which is entirely metallic blue, only known to me in the ♂ sex, are also closely related to *E. lætus* Westwood. *E. nitens* W. F. Kirby, from South Australia, was formerly (1934) considered by me to be synonymous with *E. lætus* Westwood; it now seems possible that it really represents a distinct species.

Eurys calliphenges, sp. n.

Colour.—♀. Metallic green; white are the labrum and on the downturned portions of each of the terga 2–8 a large spot; red are the legs, except the coxæ and trochanters, which, together with the front margin of the clypeus and the antennæ, are black. *Wings* slightly infuscate hyaline; stigma and wing-venation black.

Length 7 mm.

Structure, including mouth-parts and genitalia, as in *Eurys lætus* Westwood (see Benson, 1934, figs. 4 and 5).

QUEENSLAND, Stradbrooke Island, 2 ♀♀ (*H. Hacker*) (holotype in Brisbane Museum; paratype in British Museum).

NEW SOUTH WALES, Pt. Stephens, Nelson's Bay, 1 ♀, 30. viii. 1920 (in British Museum), 2 ♀♀, 31. viii. 1920 (*A. Musgrave*) (in Sydney Museum).

This species was formerly considered by me as a colour-form of *E. nitidus* W. F. Kirby, from which it does not apparently differ appreciably in any morphological detail. The difference in colour is, however, so striking that it is better to regard the two as distinct until they can be proved otherwise. *E. nitidus* W. F. Kirby has a purplish-blue abdomen and femora with the basal half black. *E. calliphenges*, sp. n., is possibly a subspecies of *E. nitidus* W. F. Kirby.

Clarissa wilsoni, sp. n.

Colour.—♀. Red; black are the head and its appendages, prothorax, mesosternum, mesepimerum, and metathorax, legs, abdominal terga 1, middle and hind margin of 6, whole of 7, 8, and 9 with saw-sheath and hypopygium. *Wings* hyaline; stigma and venation black.

Length 8 mm.

Puncturation: strong and regular on head, including the labrum; very dense in ocellar region; surface between punctures shining except behind the ocelli and on temples, where there is a fine rugulose sculpturing; punctures very shallow, almost obsolete on thorax; transversely rugulose on dorsum of abdomen.

Pubescence: fine and pale all over; mostly obsolete on dorsum of abdomen.

Head with mouth-parts normal; malar space as long as pedicel of antenna; pedicel of antenna about as broad as long; (flagellum missing); eyes further apart in front than the length of an eye (4 : 3); clypeus about twice as broad as long and emarginate in front; antennæ further from the hind margin of the clypeus than is the length of the clypeus; distance between hind ocelli about the same as one of them is from the hind margin of the head. *Thorax* with hind basitarsus about as long as the 3 following tarsal segments (measured along upper margin). *Abdomen* with saw-sheath and saw as in *C. ruficollis* Benson (1934, figs. 6 *b* and *c*).

New South Wales, Mt. Wilson, 1 ♀, x. 1930 (*F. E. Wilson*) (in Wilson Collection).

In my key to the genus (1934) this species would run to *C. ruficollis* Benson, from which species it is entirely differently coloured besides being more densely and strongly punctured on the head.

Neoeurys leptocoleum, sp. n.

Colour.—♀. Yellow; black to piceous is the head, the flagellum of the antenna except the 2 basal segments, the mesonotum and dorsum of the abdomen.

Wings hyaline; stigma white, yellow at extreme apex; venation yellowish white.

Length 4 mm.

Puncturation: head and thorax shining, with fine surface, coriaceous to rugulose surface sculpture; abdomen with fine transverse rugulose sculpture.

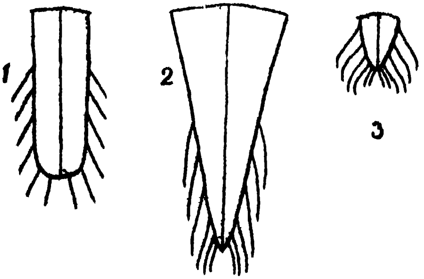
Pubescence fine and pale; obsolete on dorsum of abdomen.

Head with long malar space, about as long as ½ breadth of clypeus in front and about as long as pedicel of antenna; clypeus truncate in front; distance between eyes in front about the same as the length of an eye (viewed from in front); antenna 9-segmented; pedicel twice as long as broad and longer than funiculum.

Abdomen with the saw-sheath set up at an angle more than 45° to the hypopygium and with short straight hairs (fig. 1); saw (fig. 4).

TASMANIA, Mount Wellington, 2 ♀♀, 18. xi. 1917 (*C. E. Cole*) (holotype in Adelaide Museum; paratype in British Museum).

This species is closely related to *N. scutellatus* Forsius (the type-specimen of this species is labelled "*scutellaris*"), but differs in that the saw-sheath is not broadened at the base (*cf.* figs. 1 and 2) and is set up almost erect. From *N. aurora* Benson (1935, figs. 7 *a* and 7 *b*) it differs in the more extensive pale colour on the underside, the longer malar space, and the saw.



Saw-sheath viewed from above in:—
Fig. 1.—*Neoeurys leptocoleum*, sp. n.
Fig. 2.—*N. scutellatus* (Forsius).
Fig. 3.—*N. trochilus*, sp. n.

Neoeurys evansi, sp. n.

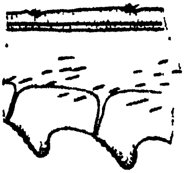
Colour.—♀. Black; yellow are the labrum, the underside of the flagellar segments except the 1st, the legs except the coxæ, the sides of the abdominal terga 6–8, and the whole of tergum 9, the sterna from the 2nd, and the saw-sheath; wings hyaline; costa, subcosta, and basal ⅓ of stigma yellow; rest of venation piceous.

Length 5 mm.

Puncturation: the whole of the insect is dull, through the surface being finely squamose or coriaceous; on the abdomen these squamæ tend to be arranged transversely.

Pubescence fine and pale over body except dorsum of abdomen.

Head with long malar space, about as long as ½ the breadth of the front of the clypeus and about as long as the pedicel of antenna; clypeus slightly emarginate in front, the front margin depressed in the middle; distance between eyes in front about the same as the length of an eye (viewed from in front); antenna 9-segmented; pedicel about 1½ times longer than its greatest breadth and about equal to the funiculum.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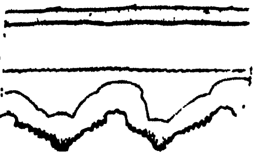
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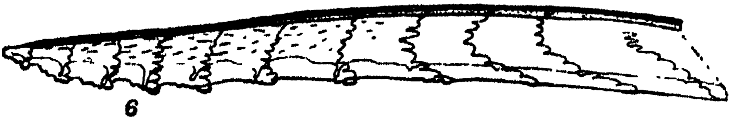
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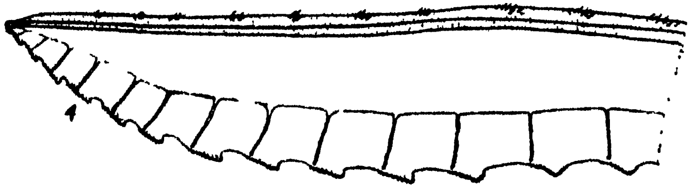
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Saw of:—

Fig. 4.—*Neoeurys leptocoleum*, sp. n.
Fig. 6.—*N. trochilus*, sp. n.

Portion of saw to include 9th and 10th teeth from the apex in:—

Fig. 5.—*Neoeurys evansi*, sp. n.
Fig. 7.—*N. turneri*, sp. n.

Abdomen with saw-sheath much as in *N. leptocoleum*, sp. n., but it is set up at an angle of less than 45° to the hypopygium; saw (fig. 5).

TASMANIA, National Park, 3500 ft., 1 ♀, xii. 1936, beaten from *Nothofagus cunninghami* Hook. (*J. W. Evans*) (British Museum).

This species is related to *N. scutellatus* Forsius and *leptocoleum*, sp. n., but is distinguished at once by its peculiar coriaceous surface.

Neoeurys trochilus, sp. n.

Colour.—♀. Black with a purplish sheen; yellow are the labrum and mouth-parts, the legs (except that the bases of the femora and apex of hind tibia are brown), and abdominal sterna. *Wings* hyaline; stigma and venation yellow.

Length, ♀, 2·5 to 3 mm.

Puncturation: head and mesopleura dull, with dense coriaceous surface; mesonotum shining, with a faint coriaceous surface between a few widely scattered subobsolete punctures.

Pubescence pale and fine, becoming dense on face and mesopleura; obsolete on dorsum of abdomen.

Head: malar space scarcely ¼ as long as the front margin of the clypeus and about as long as pedicel of antenna; clypeus truncate in front; distance between eyes in front less than length of an eye from that viewpoint (5 : 6); antenna 10–11-segmented; pedicel about ⅗ as broad as long, and about as long as funiculum.

Abdomen strongly compressed laterally, with the saw-sheath set up at an angle of more than 45° to the horizontal; viewed from above the saw-sheath projects very little beyond the apex of the abdomen (fig. 3); saw (fig. 6).

WEST AUSTRALIA, Nongarra, from flowers of *Acacia* sp., 25 ♀♀, 18–22. viii. 1935, 3 ♀♀, 23. viii.–5. ix. 1935 (*R. E. Turner*) (holotype and paratypes in British Museum; paratypes also in Australian Museums at Brisbane, Sydney, Canberra, Melbourne, Adelaide, and Perth).

This species is superficially like *N. brevivalvis* Benson (1935, with figs. 6 *a* and 6 *b*) from Queensland; the similar position of the saw-sheath in both species suggests a similarity in oviposition habit. *N. brevivalvis* Benson differs by its shining and sparsely punctured head, the slightly greenish instead of purplish sheen in coloration, the longer and more converging eyes, which, when viewed from in front, are no further apart than the length of an eye, while in its dark labrum and hind femora and form of its saw it more closely resembles *N. turneri*, sp. n.

Neoeurys erecta, sp. n.

This species is very close to *N. trochilus*, sp. n., differing only in the following characters:—Abdomen entirely black, without pale sterna, femora of all legs black and outside of hind tibia and tarsi fuscous; antenna 9-segmented; malar space about ⅕ as long as the front margin of the clypeus and about ¾ as long as pedicel.

West Australia, Dongarra, from flowers of *Acacia* sp., 4 ♀♀, 23. viii.–5. ix. 1935, and 4 ♂♂, 18–22. viii. 1935 (*R. E. Turner*).

Neoeurys turneri, sp. n.

Colour.—♂♀. As in *N. trochilus*, sp. n., except that the labrum, mandibles, all the femora, and the abdomen are entirely black, while the apex and outer side of the hind tibia and tarsi are fuscous.

Length 3 to 4 mm.

Puncturation and *pubescence* as in *N. trochilus*, sp. n.

Head with malar space only about ⅙ as long as the front margin of the clypeus and about ½ length of the pedicel; clypeus truncate in front; distance between eyes in front less than length of an eye from that view-point (5 : 6); antenna 10–11-segmented; pedicel about ⅗ as broad as long and about as long as the funiculum.

Abdomen not noticeably compressed laterally, with the saw-sheath set up at an angle of less than 45° to the hypopygium; saw-sheath viewed from above as in *N. trochilus*, sp. n.; saw (fig. 7).

West Australia, Dongarra, from flowers of *Acacia* sp., 5 ♀♀, 5 ♂♂, 13–22. viii. 1935, 5 ♀♀, 2 ♂♂, 23. viii.–5. ix. 1935, 5 ♀♀, 3 ♂♂, 6–19. ix. 1935, and 2 ♀♀, 20–25. ix. 1935 (*R. E. Turner*) (holotype and paratypes in British Museum; paratypes also in Australian Museums at Brisbane, Sydney, Canberra, Melbourne, Adelaide, and Perth).

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Benson, Robert B. 1934. "A Classification of the Sawflies of the Family Pterygophoridæ, with a Revision of the Australian Members of the Subfamily Euryinæ (Hymenoptera, Symphyta)." Trans. Roy. Ent. Soc. London, vol. lxxxii. pp. 461–478, figs. 1–9.

——. 1935. "New Australian Sawflies." Mem. Qd. Mus., Brisbane, vol. x. pp. 211–220, figs. 1–9.

XLII.—Nelees *Navás* 1912, *a pre-occupied Name in the* Myrmeleonidæ (*Neuroptera*). By D. E. Kimmins, Department of Entomology, British Museum (Natural History).

In 1911, Navás proposed the name *Nelees* for a genus with *Myrmeleon tristis* Hagen as genotype (Rev. Zool. Afr. i. p. 244 [note]), and later in the same volume (p. 406, 1912) he records the fact that Banks had already put forward a name, *Hagenomyia* for the same species. *Nelees* Navás, 1911, is thus a synonym of *Hagenomyia* Banks.

In spite of this, in 1912 (Brotéria, x. p. 31) Navás again used the name *Nelees*, this time applying it to a genus with an entirely different species, *Myrmeleon nemausiensis* Borkh., as type. The use of the name *Nelees* in 1911 and the subsequent case of homonymy appear to have been overlooked by later workers, and many species have been placed in *Nelees* Navás (1912).

Navás has since created several genera more or less closely allied to *Nelees* 1912, and *Neleoma* 1914 appears to be the earliest synonym. His character separating the two genera is the proportionate lengths of the tarsal segments :—

Nelees, 1 and 5 long, 5 longest, 2–4 short.
Neleoma, 1–4 short, 1 longer than 2, 5 longer than 1.

That is, in *Neleoma* the first segment is a little longer than the second, while in *Nelees* it is distinctly longer. As a generic character, this appears to me to be quite inadequate and I doubt whether it would be found to be consistent if careful measurements were made.

I am therefore synonymizing the two names, and propose that *Nelees* Navás, 1912, be quoted as :—

NELEOMA Navás, 1914.

Mem. Pont. Acc. n. Linc. xxxii. p. 95.

Genotype : *Neleoma striolatum* Navás.

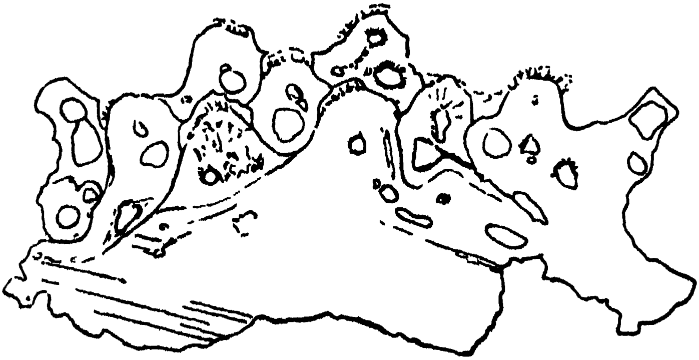
=NELEES Navás, 1912 (nec 1911).

Brotéria, x. p. 32.

Genotype : *Myrmeleon nemausiensis* Borkh.

XLIII.—*The Dermal Tubercles of the Upper Devonian Shark,* Cladoselache. By Sir ARTHUR SMITH WOODWARD, F.R.S., and ERROL I. WHITE, D.Sc.

IN a recent paper (1) on some fossil remains of Elasmobranchs from the Upper Devonian of Wildungen, Germany, Dr. Walter Gross describes jaws like those of a Hybodont shark (*Protacrodus vetustus* Jaekel) which were found in the same nodule as a typically Acanthodian squamation. He gives reasons for supposing that the jaws, teeth, and scales belong to the same fish. He therefore recognises a primitive Elasmobranch in which the covering of the body was not the usual dentine-shagreen, but a squamation like that of the Acanthodians. At the same time he remarks that comparison cannot be made with the dermal tubercles of the other Upper Devonian sharks which have Cladodont teeth (e.g., *Cladoselache*), because their microscopic structure has not hitherto been examined.



Longitudinal vertical section of a dermal denticle of *Cladoselache* consisting of numerous denticles, enlarged about 45 times. Cleveland Shale, Ohio, U.S.A. Brit. Mus. no. P.9294.

To make the comparison possible, we have now had sections prepared of some dermal tubercles of the typical *Cladoselache* from the Cleveland Shale of Ohio. In outward appearance they resemble ordinary Elasmobranch shagreen, and the sections prove that they consist entirely of the usual dentine. As remarked by Bashford Dean (2), many of the tubercles are simple cones, but the majority are small fused clusters of cones. Each cone has a large pulp-cavity which is closed at the base; and when the cones are clustered (as in the accompanying figure), each cavity remains separate and is not connected with any common cavity below. The cones are more or less curved, so that a vertical section sometimes shows the pulp-cavity in two parts near the apex and the base (as in the two cones at the left side of the figure). The dentine is translucent, and the dentinal tubules are too little permeated with dark mineral matter to be well exhibited in the fossils.

Cladoselache, therefore, is a typical Elasmobranch in the character of its shagreen; and it may be noted that the fusion of the dermal denticles into clusters has also been observed in some Jurassic Hybodont sharks (3).

Mr. Moy-Thomas informs us that he has made sections of the circumorbital ring of *Cladoselache*, and finds that it also consists of dentine.

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(2) DEAN, B. 1909. "Studies on Fossil Fishes (Sharks, Chimæroids, and Arthrodires)." Mem. Amer. Mus. Nat. Hist. vol. ix, p. 214.

(3) WOODWARD, A. S. 1889. "Catalogue of Fossil Fishes in the British Museum (Natural History)," pt. 1, p. 260, pl. viii. figs. 2–4.

XLIV.—*New Palæarctic and Indo-Australian* Lymantriidæ *in the British Museum Collection*. By C. L. COLLENETTE, F.R.E.S.

[Plate XIV.]

OF the insects described in the following paper, the majority have been standing unnamed in the Museum collection for a considerable period. Others, as will be seen from the text, have recently been submitted to me for determination.

All types are in the Museum collection.

Leucoma cryptadia, sp. n.

The type ♀ of *Leucoma cygna* Moore, 1877, from the S. Andamans, is unique, and is in poor condition. Hampson (Fauna Brit. India, 1893, i. p. 489) states that the species occurs also in Ceylon, and describes and illustrates a Ceylon ♂.

I have compared the type ♀ of *L. cygna* with ♀♀ from Ceylon, and find that they should be separated. Veins *M*2 and *M*3 in 6 ♀♀ and 8 ♂♂ from Ceylon arise from a point, whereas in the type of *L. cygna* they are rather widely separated. The fore wing of the ♀ has a different appearance, being less glossy in *L. cygna*, and having a more sharply angled tornus than in Ceylon specimens.

Expanse, ♂♂ 36–40 mm., ♀♀ 39–44 mm.

1 ♂ (holotype), 1 ♀ (allotype), 2 ♂♂, 4 ♂♂ (paratypes), Kandy, Ceylon, February–April and June–September, ex Mackwood and Joicey collections; 1 ♂, Kegelle, October 1909, and 1 ♀, Uva, 600 ft., December 1912 (paratypes), ex Mackwood collection; 1 ♂ (paratype), Habarana, November 1902, ex Swinhoe collection; 1 ♂ (paratype), Maskeluya, September, ex Joicey collection; 1 ♂ (paratype), Pendaloya, February, ex Green collection (Hampson's neallotype of *L. cygna* Moore).

Leucoma wiltshirei, sp. n. (Pl. XIV. fig. 14.)

♂. Palpus, antennal shaft, head, body, and legs whitish, pectinations of antenna pinkish buff. Wings above and beneath white, thinly scaled and semi-diaphanous; fringes white.

Expanse, ♂♂, 27–28 mm.

1 ♂ (holotype), Rowanduz, Kurdistan, 30th July 1935; 1 ♂ (paratype), Diana, Kurdistan, 31st July 1935; both collected by E. P. Wiltshire, who has most kindly presented the holotype for inclusion in the British Museum collection.

The single pair of spurs on the hind tibia, the absence of an areole, and the fact that vein R2 in the fore wing arises from the cell, justifies the inclusion of this insect in the genus *Redoa*. It does not appear to be closely related to any other described species.

Arctornis xuthocraspeda, sp. n. (Pl. XIV. fig. 18.)

♂. Palpus warm buff. Antennal shaft pale pinkish buff, pectinations slightly darker. Head tawny to ochraceous tawny. Thorax and abdomen, above and beneath, pale pinkish buff to whitish. Legs pale pinkish buff, tinged on fore and middle legs with orange-buff. Wings, above and beneath, white, semidiaphanous; costa of fore wing edged narrowly with orange-buff; fringes orange-buff to pale yellow-orange.

♀. Resembles the ♂, but with fringes and costa of fore wing white.

Expanse, ♂♂ 36–38 mm., ♀♀ 42–44 mm.

1 ♂ (holotype), 1 ♀ (allotype), 4 ♂♂, 1 ♀ (paratypes), Khasi Hills, Assam, ex Swinhoe and Joicey collections; 1 ♂, 1 ♀ (paratypes), Cherri Punji, ex Swinhoe collection.

In structure *A. xuthocraspeda* is without an areole in the fore wing, vein *M*1 in the fore wing arises from the upper angle of the cell, veins *Rs* and *M*1 in the hind wing are stalked, and the harpe of the ♂ genitalia is long and stout, cylindrical, tapering to a point and almost straight. Specimens have previously been confused with *Redoa diaphana* Moore, in which veins *R*1 and *R*2 in the fore wing are stalked and the harpe short and strongly curved; also with *Redoa silhetica* Walker (represented in the British Museum only by the type ♀), which has an areole in the fore wing, vein *M*1 arising from well below the upper angle of the cell and veins *Rs* and *M*1 in the hind wing arising separately.

Redoa dialitha, sp. n. (Pl. XIV. fig. 4.)

♀. Palpus pale pinkish buff, on the outer and upper sides amber-brown. Antennal shaft whitish, sparsely irrorated with fuscous; pectinations pinkish buff. Head amber-brown, at the base of the palpi white. Thorax, abdomen, and legs white, with spots of mummy-brown on the outer side of fore and middle legs. Fore wing white, covered, except in the costal area, with a delicate network of argus-brown, and with a postmedial fascia of the same colour running inwardly oblique from above vein *M*2 to below vein *Cu*2, thence to the inner margin at right angles; a spot of mummy-brown on the discocellulars; fringe argus-brown. Hind wing white, fringe argus-brown. Under side of both wings white, discocellulars faintly marked with argus-brown, terminal areas shaded with argus-brown; costa of fore wing narrowly edged with orange-buff; fringes argus-brown.

Expanse, ♀, 46 mm.

1 ♀ (holotype), North Celebes, ex Joicey collection.

A handsome species, allied to *Redoa riguata* Snellen.

Redoa egerina gymnophleps, subsp. n.

♂ & ♀. Distinguished from *Redoa e. egerina* (Singapore) by the presence of a strong line of Sanford's-brown along the lower half of the discocellulars. The veins of both wings are unscaled and considerably darker than the wing surface, and the wing expanse is greater.

In the ♂ genitalia, the tip of the valve bears a symmetrical point, whereas in *Redoa e. egerina* the valve is broader and the point is thrown more to one side.

Expanse, ♂ 35 mm., ♀♀ 40–41 mm.

1 ♂ (holotype), 1 ♀ (allotype) and 1 ♀ (paratype), Lebong Tandai, West Sumatra, 1920–1923 (*C. J. Brooks*). A ♀ from Bidi, Sarawak, 1907–1908 (*C. J. Brooks*), appears to belong to this subspecies.

Pellucens zeugosticta, sp. n. (Pl. XIV. fig. 6.)

♀. Palpus white, on the outer side and at the tip Prout's brown. Antennal shaft Prout's brown, at the base whitish, pectinations light buff. Head, thorax, and abdomen above and beneath, and legs, whitish, tinged with maize-yellow on patagium and tegula; two paired spots of burnt lake dorsally on each segment of the abdomen; the tarsi, and the tibiæ on the inner side, Prout's brown. Wings and fringes, above and beneath, whitish and semi-diaphanous; on the upper side of the fore wing a faint tawny olive mark on the discocellulars, and a series of preterminal interneural almost rectangular tawny olive spots, reproduced also on the under side.

Expanse, ♀, 49 mm.

1 ♀ (holotype), Talagura, Palawan, Philippine Islands, 12th May, 1913, ex Wileman collection.

Somewhat resembles *Pellucens aphrasta* Collenette, 1932, but vein *R*2 in the fore wing rises before vein *R*5 from the stalk of veins *R*2 to *R*5; in *P aphrasta* vein *R*2 rises after vein *R*5.

Euproctis dolichocera, sp. n. (Pl. XIV. fig. 25.)

♂. Antennal shaft white, pectinations buckthorn-brown. Palpus, body, legs, and wings white; a faint streak of sayal-brown on the under side of the costa at the base of the fore wing.

♀. Anal tuft orange-buff, and lacking the sayal-brown streak on the under side of the fore wing.

Expanse, ♂♂ 27–30 mm., ♀♀ 33–35 mm. Length of ♂ antenna 7–7·5 mm.

1 ♂ (holotype), 1 ♀ (allotype), 3 ♂♂ (paratypes), Hog Harbour, Santo Islands, New Hebrides, August 1925, (*P. A. Buxton*); 2 ♂♂, 1 ♀, Lolopuépué, Ile d'Aoba, New Hebrides, 1915; 1 ♂, New Hebrides (*G. F. Mathew*).

Easily distinguished from *Euproctis galactopis* Turner by the whiteness of the wings, the Queensland species having a creamy tinge, and also by the considerably greater length of the male antennæ.

Vein *M*3 is absent in the hind wing.

Euproctis leucozona, sp. n. (Pl. XIV. fig. 24.)

♂. Palpus pale orange-yellow, on the outer side Prout's brown. Antennal shaft light buff, pectinations pinkish buff. Head and thorax Naples-yellow. Basal segments of abdomen, above and beneath, pale pinkish buff, the remainder bistre; anal tuft orange-buff. Pectus and legs light buff to warm buff. Fore wings Naples-yellow; a rather poorly defined tawny olive medial fascia, commencing broadly on the costa at one-half, running slightly oblique inwardly, and narrowing, to the inner margin at one-half, the portion between vein *Cu*2 and the inner margin being darker than the remaining portion; fringe Naples-yellow. Hind wing, under side of both wings, and fringes pale pinkish buff.

♀. Resembles the ♂.

Expanse, ♂♂ 36–37 mm., ♀♀ 49–54 mm.

1 ♂ (holotype) and 1 ♀ (allotype), Siao-lou, 1896 and 1903; 2 ♀♀ (paratypes), Tien-tsuen, 1897 and 1899; 3 ♂♂, 1 ♀ (paratypes), Ta-tsien-lou, Szechwan, 1906 and 1910; all ex Oberthür collection.

Veins *M*3 and *Cu*1 of the hind wing are not stalked, in which respect, among others, the species differs from *Euproctis schaliphora* Collenette. The medial fascia of the fore wing joins the costa at one-half, whereas in *Euproctis montis* Leech it is directed almost towards the apex.

The insect which stood until recently in the British Museum collection as the allotype ♀ of *Euproctis montis* Leech, from Chia-kou-ho, apparently determined by

Leech but not referred to in original description, belongs to the present species.

Euproctis brachycera, sp. n. (Pl. XIV. fig. 21.)

♂. Palpus bistre, at the tip and beneath pinkish buff. Antennal shaft whitish, pectinations cinnamon-buff. Head, thorax, and base of abdomen pinkish buff, mixed on the patagium with Mars-yellow; remainder of abdomen sepia; anal tuft pale orange-yellow. Pectus, venter, and legs pale pinkish buff. Fore wing and fringe pale pinkish buff; some slight irroration of Mars-yellow at the base of the wing and along the inner margin; three very faint fasciæ of Mars-yellow—antemedial, postmedial, and subterminal,—all roughly parallel with the termen; fringe pale pinkish buff. Hind wing, under side of both wings, and fringes pale pinkish buff.

♀. Resembles the ♂, but the anal tuft sepia. The fasciæ on the fore wing are almost entirely obsolete.

Expanse, ♂♂ 28–33 mm., ♀ 47 mm.

1 ♂ (holotype), 1 ♀ (allotype), 5 ♂♂ (paratypes), Kanchirei, Formosa, 1000 ft., April and May 1908 (*A. E. Wileman*).

Somewhat similar to *Euproctis subfasciata* Walker (Darjiling) in appearance, but the antennæ of the present species are considerably shorter, and there are other structural differences.

Euproctis hagna, sp. n. (Pl. XIV. fig. 1.)

♂. Palpus warm buff, on the outer side cinnamon-brown. Antennal shaft white, pectinations buckthorn-brown. Head, thorax, and base of abdomen light buff to warm buff, the remainder of the abdomen slightly shaded with drab; anal tuft antimony-yellow. Pectus light buff. Venter warm buff. Legs pale pinkish buff, the femora fringed with light buff. Fore wing a uniform buff-yellow, the fringe slightly lighter. Hind wing and fringe pale pinkish buff, inner marginal area shaded with warm buff. Under side of both wings and fringes pale pinkish buff.

♀. Resembles the ♂, but with less shading of warm buff on the upper side of hind wing.

Expanse, ♂ 49 mm., ♀♀ 61–63 mm.

1 ♂ (holotype), 1 ♀ (allotype), 2 ♀♀ (paratypes), Gopaldhara, Darjiling, 3440–5800 ft. (*H. Stevens*). 2 ♀♀, Sikkim (*H. Stevens and O. Müller*).

May be placed near to *Euproctis sulphurescens* Moore.

Euproctis percnogaster, sp. n (Pl. XIV. fig. 8.)

♂. Palpus warm buff, on the outer side cinnamon brown. Antennal shaft warm buff, pectinations cinnamon-buff. Head and thorax light buff to antimony-yellow. Base of abdomen light buff, the remainder Prout's brown; anal tuft raw sienna. Pectus, venter, and legs light buff to warm buff. Fore wing and fringe maize-yellow; a broad russet medial fascia, running slightly oblique inwardly and almost straight from discocellulars to inner margin, broken at the lower angle of the cell and also between vein *Cu*2 and the anal vein. Hind wing and fringe light buff. Under side of both wings and fringes light buff; costal area of fore wing, and to a lesser extent of hind wing, shaded with buckthorn-brown.

Expanse, ♂♂, 29–34 mm.

1 ♂ (holotype), 3 ♂♂ (paratypes), Sabathu, near Simla, 1888 and June 1889 (*H. C. Harford*).

May be placed near to *Euproctis leithiana* Moore, from which it may be readily distinguished by the dark abdomen.

Euproctis mackwoodi, sp. n. (Pl. XIV. fig. 11.)

♂. Palpus warm buff, on the outer side cinnamon-brown. Antennal shaft white, pectinations cinnamon-buff. Head, thorax, and base of abdomen Naples-yellow, remainder of abdomen fuscous; anal tuft raw sienna. Pectus and legs warm buff to light buff, with a streak of cinnamon-brown on the inner side of the tibia. Venter light buff mixed with fuscous. Fore wing Naples-yellow; a very broad medial fascia composed of cinnamon-brown irroration, the proximal margin indented where it crosses the lower margin of the cell between veins *Cu*1 and *Cu*2, the distal margin almost straight; the antemedial and postmedial fasciæ are indicated by a complete absence of irroration, and in some specimens there is a trace of irroration on the proximal side of the antemedial fascia and on the distal side of the postmedial fascia; three rather large subterminal interneural bone-brown spots below veins *R*4, *M*1, and *Cu*2, with a smaller spot, which may be obsolete, below vein *R*5; fringe Naples-yellow. Hind wing and fringe cream-colour. Under side of both wings and fringes ivory-yellow; the whole of the central area of the fore wing and the costal area at the base in both wings suffused with snuff-brown.

♀. Resembles the ♂.

Expanse, ♂♂ 37–42 mm., ♀♀ 50–55 mm.

1 ♂ (holotype), 1 ♀ (allotype), 2 ♂♂ (paratypes), Ohiya, Ceylon, November 1907; 2 ♂♂, 1 ♀ (paratypes), Pattipolla, October 1907 and April 1908; 1 ♂ (paratype), Hakgala, March 1907; 1 ♀ (paratype), Nuwara Eliya, July 1897; 1 ♀ (paratype), Haldumulla, June 1899; all ex Mackwood collection. 1 ♂, 1 ♀ (paratypes), Uva, 6000 ft., October, ex Joicey collection.

Has been confused in the past with *Euproctis guttata* Walker, which has no spot at the tornus of the fore wing.

Euproctis khasi, sp. n. (Pl. XIV. fig. 17.)

♂. Palpus pale pinkish buff, on the outer side Dresden-brown. Antennal shaft Naples-yellow, pectinations ochraceous-buff. Head, thorax, and base of abdomen Naples-yellow, remainder of abdomen pale pinkish buff, the segments edged posteriorly with snuff-brown, anal tuft orange-buff. Pectus, venter, and legs pale pinkish buff to light buff. Fore wing mustard-yellow; a patch of cream-colour subbasally; antemedial and postmedial fasciæ of cream-colour, each bowed (convexity terminad) from costa to vein *Cu*2, thence oblique inwardly to the inner margin; the areas bordering these fasciæ, with the whole of the medial area excepting the discocellulars, irrorated rather heavily with cinnamon-brown, the irrorated area produced almost to the termen between veins *R*5 and *M*1 and also *M*2 and *Cu*1; a conspicuous interneural fuscous spot subterminally below vein *R*4, and a very small spot (absent in some specimens) above vein *R*4; apical area cream-colour; fringe mustard-yellow. Hind wing and fringe pale pinkish buff. Under side of fore wing pale pinkish buff, with a streak of cinnamon-brown along the upper side of the cell and between veins *R*5 and *M*1, but not reaching the termen; fringe

Naples-yellow. Under side of hind wing and fringe pale pinkish buff.

♀. Resembles the ♂, but with an enlarged area of cinnamon-brown on the under side of the fore wing.

Expanse, ♂♂ 25–33 mm., ♀♀ 37–45 mm.

1 ♂ (holotype), 1 ♀ (allotype), 4 ♂♂, 5 ♀♀ (paratypes). Khasi Hills, Assam, ex Elwes and Joicey collections. 2 ♂♂, 2 ♀♀, Gopaldhara (*H. Stevens*).

Related to *Euproctis kanshireia* Wileman.

Euproctis leontocephala, sp. n. (Pl. XIV. fig. 10.)

♀. Palpus warm buff, on the outer side Dresden-brown. Antennal shaft buff-yellow, pectinations clay-colour. Head, patagium, and tegula warm buff, remainder of thorax ochraceous-tawny. Abdomen snuff-brown; anal tuft tawny olive, ringed at the base with ochraceous-buff. Pectus, venter, and legs warm buff. Fore wing buff-yellow; the whole of the interior of the wing irrorated very thickly with tawny on a light ground, the margin of this area running from the base of the wing along the upper edge of the cell to the origin of vein *R*5, thence straight to the termen between veins *M*2 and *M*3, following the termen to vein *Cu*2, thence bowed (concavity tornad) to the inner margin at five-sixths; a faint darker spot on the discocellulars; fringe buff-yellow. Hind wing and fringe maize-yellow; the interior of the wing, excepting the costal and terminal areas, faintly shaded with wood-brown. Under side of both wings and fringes maize-yellow, the markings of the upper side reproduced below in wood-brown, but the markings on the fore wing not reaching the termen.

Expanse, ♀, 46 mm.

1 ♀ (holotype), Mt. Makiling, Luzon (*P. I. Baker*).

Related to *Euproctis solitaria* Van Eecke. The name of the species has been chosen in consequence of the resemblance of the markings on the fore wing to the head of a lion, seen in profile.

Euproctis phaulida, sp. n. (Pl. XIV. fig. 16.)

♂. Palpus, head, thorax, and abdomen warm buff, the legs and underside of body somewhat lighter. Antenna ochraceous-tawny to buckthorn-brown. Wings and fringes, above and beneath, light buff; the basal three-fourths of the fore wing entirely wood-brown, the distal boundary of this area commencing on the costa at about two-thirds, thence oblique outwardly to just below vein *M*3, thence curving inwardly (concavity terminad) to the inner margin at about three-fourths; on this wood-brown area is a slight and scattered irroration of darker scales.

♀. Resembles the ♂.

Expanse, ♂♂ 21–23 mm., ♀♀ 29–31 mm.

1 ♂ (holotype), 1 ♀ (allotype), 3 ♂♂ and 1 ♀ (paratypes), Jhajra, Dehra Dun, United Provinces, 1st April 1926 (*C. F. C. Benson*); 2 ♂♂ and 2 ♀♀ (paratypes), Dehra Dun, 6th May 1929 (*Gauri Dutt*); 2 ♂♂ (paratypes), Dehra Dun, 17th April, 1926, defoliating *Terminalia tormentosa*.

May be placed near to *Euproctis chalcostoma* Collenette.

The series, with the exception of two paratypes, has kindly been presented to the British Museum by the Forest Research Institute, Dehra Dun.

Euproctis korinchi, sp. n. (Pl. XIV. fig. 5.)

♂. Palpus deep chrome, with a few scales of Brussels-brown on the outer side. Head, thorax, and antennal shaft deep chrome, pectinations clay-colour. Abdomen pale orange-yellow. Pectus, venter, and legs pale orange-yellow to deep chrome. Fore wing apricot-yellow; an antemedial fascia composed of a well-defined, outwardly oblique band of Sudan-brown across the cell, and an inwardly oblique line from the origin of vein *Cu*2 almost to the inner margin; a faint patch of Sudan-brown on the distal side of the discocellulars; a postmedial fascia of Sudan-brown, broken at the veins, slightly bowed (concavity terminad) from the costa to vein *Cu*1, thence inwardly oblique to the inner margin; fringe apricot-yellow. Hind wing and fringe pale orange-yellow. Under side of both wings and fringes light orange-yellow; a streak of antique brown along the basal half of the costa of the fore wing.

Expanse, ♂ 41 mm., antenna 11 mm.

1 ♂ (holotype), slopes of Mt. Korinchi, S.W. Sumatra, 7300 ft., August–September 1921 (*C., F., and J. Pratt*), ex Joicey collection.

Somewhat resembles *Euproctis hypocloa* Collenette, but with a differently shaped postmedial fascia. The antennæ are of more than usual length.

Euproctis tanaoptera, sp. n. (Pl. XIV. fig. 7.)

♀. Palpus, antennal shaft, head, thorax above and beneath, and legs warm buff to pale orange yellow; yellow; pectinations of antenna clay-colour. Abdomen Prout's-brown, anal tuft warm buff. Fore wing light orange-yellow, irrorated sparsely in the area below the cell and vein *M*3 with Prout's-brown; the distal two-thirds of the costal area pale orange-yellow; a broad and well-defined whitish antemedial fascia, running from the upper margin of the cell to the inner margin, projecting distally at the lower margin of the cell; a whitish postmedial fascia, of the same width as the antemedial fascia, running from vein *R*5, bowed (concavity basad) to the inner margin; fringe light buff. Hind wing Brussels-brown; fringe light buff, this colour also to a slight extent invading the termen and apical area. Under side of fore wing Brussels-brown, grading in costal and terminal areas to light buff; fringe light buff. Under side of hind wing as on upper side.

Expanse, ♀, 50 mm.

1 ♀ (holotype), North Celebes, ex Joicey collection.

May be placed near to *Euproctis cina* Strand.

Euproctis oonophora, sp. n. (Pl. XIV. fig. 12.)

♂. Palpus pale yellow-orange, on the outer side Brussels-brown. Antenna cinnamon-buff, the pectinations slightly lighter. Head and patagium pale yellow-orange, remainder of thorax cinnamon-buff. Abdomen above and beneath Verona-brown, anal tuft pale orange-yellow. Pectus and legs light buff to warm buff. Fore wing sayal-brown, with a slight admixture of buff-yellow scales over the whole area; a large and conspicuous ovate patch of buff-yellow, reaching from just above the origin of vein *M*2 to just below the anal vein; fringe buff-yellow. Hind wing Verona-brown; fringe buff-yellow to maize-yellow. Under side of both wings Verona-brown mixed with light buff; costal area of fore wing tinged with clay-colour; fringes maize-yellow.

Expanse, ♂, 36 mm.

1 ♂ (holotype), Lebong Tandai, W. Sumatra, 21st July, 1921 (*C. J. Brooks*).

May be placed near to *Euproctis præcurrens* Walker.

Euproctis chlorogaster, sp. n. (Pl. XIV. fig. 3.)

♂. Palpus raw umber, on the lower side buckthorn-brown. Antennal shaft Brussels-brown, pectinations Mars-yellow. Head and patagium Mars-yellow, remainder of thorax Brussels-brown. Abdomen Mars-yellow, anal tuft light buff. Pectus, venter, and legs warm buff to light buff. Fore wing Brussels-brown; a deep chrome streak on the discocellulars, widest at the centre, narrowing to a point at the upper and lower angles of the cell; fringe Saccardo's-umber. Hind wing and fringe deep chrome. Under side of fore wing pale orange-yellow, very faintly shaded in the apical and terminal areas with Brussels-brown; fringe Saccardo's-umber. Under side of hind wing pale orange-yellow, the fringe slightly darker.

Expanse, ♂♂, 43–47 mm.

1 ♂ (holotype), 6 ♂♂ (paratypes), Nomnagihé, 25 miles south of Wangaar, Dutch New Guinea, 2000 ft., January–February 1921 (*C., F., and J. Pratt*), ex Joicey collection; 1 ♂, Pukusam, Humboldt Bay District, Dutch New Guinea, 15th April, 1937 (*W. Stüber*).

This handsome insect somewhat resembles *Euproctis mambara* Bethune-Baker, which, however, has a black abdomen.

Euproctis kunupi, sp. n. (Pl. XIV. fig. 13.)

♂. Palpus, head, and antennal shaft light orange yellow, pectinations warm buff. Thorax light orange yellow to deep chrome. Abdomen above and beneath pale pinkish buff. Pectus, fore and middle leg pale orange-yellow, hind leg light buff. Fore wing benzo-brown lightly mixed with tawny; a broad border of light orange-yellow along the whole of costa and termen, narrower along the medial third of the costa; a faint light spot at the lower angle of the cell; a patch of tawny at the edge of the dark area between veins *R5* and *M1*, another between veins *M3* and *Cu1* which almost touches the termen, and a third, smaller, between vein *Cu2* and the anal vein; fringe light orange-yellow. Hind wing above and beneath pale pinkish buff, fringe maize-yellow. Under side of fore wing benzo-brown; the light border shaped as on the upper side, but pale pinkish buff tinged with pale orange-yellow; a line of orange-buff along the costa, not reaching the apex; fringe light orange-yellow.

Expanse, ♂♂, 27–29 mm.

1 ♂ (holotype) and 2 ♂♂ (paratypes), Mt. Kunupi, Menoo Valley, Weyland Mountains, Dutch New Guinea, 6000 ft., November 1920 to January 1921 (*C., F., and J. Pratt*); ex Joicey collection.

Related to *Euproctis diselena* Collenette.

Euproctis hemixantha, sp. n. (Pl. XIV. fig. 27.)

♂. Palpus, antennal shaft, and head pale orange-yellow, pectinations of antenna buckthorn-brown. Thorax, and abdomen above and beneath, bistre; anal tuft orange-buff. Pectus and legs light buff. Fore wing light orange-yellow; the whole of the basal half of the wing, excepting between the costa and the cell, sepia, the distal edge of the dark area almost straight but not clearly defined; fringe light orange-yellow. Hind wing sepia, with a terminal band of light orange-yellow; fringe light orange-yellow. Under side of both wings, and fringes pale orange-yellow; basal half of both wings, excepting the costal area of the fore wing, sepia.

Expanse, ♂, 34 mm.

1 ♂ (holotype), Mount Kina Balu, North Borneo, 5th August, 1903 (*John Waterstradt*); ex Oberthür collection.

May be placed near to *Euproctis sexmacula* Swinhoe.

Euproctis asteroides, sp. n. (Pl. XIV. fig. 20.)

♀. Palpus and antenna pinkish buff. Head and thorax clay-colour to cinnamon-buff. Abdomen above and beneath bistre; anal tuft pale orange-yellow. Pectus and legs pinkish buff. Fore wing sayal-brown, irrorated, except in the costal and apical areas, with Verona-brown; a conspicuous patch of cream-colour from the origin of vein *Cu*1 to the origin of vein *Cu*2, with short rays extending outwardly along each of the veins which it touches, also the discocellulars and the lower margin of the cell, and with a longer ray, slightly bowed (convexity basad), extending to the inner margin; a series of metallic silvery-white interneural preterminal spots, only visible when viewed at certain angles; fringe sayal-brown. Hind wing Saccardo's-umber, the fringe lighter. Under side of both wings snuff-brown, the costal area of the fore wing and fringes of both wings lighter.

Expanse, ♀♀, 28–31 mm.

1 ♀ (holotype) and 1 ♀ (paratype), Lebong Tandai, W. Sumatra, 1920–23 and 22nd December, 1921 (*C. J. Brooks*).

Distinguished by the conspicuous rayed star on the fore wing. Vein *M*3 is absent in the hind wing.

Cobanilla psola, sp. n. (Pl. XIV. fig. 22.)

♂. Palpus clove-brown, beneath lighter. Antennal shaft clove-brown, pectinations olive-brown. Head and patagium buffy brown, remainder of thorax, and abdomen clove-brown. Pectus, venter, and legs pale pinkish buff to pinkish buff, mixed on the legs with olive-brown. Fore wing and fringe clove-brown, hind wing and fringe olive-brown. Under sides of both wings and fringes olive-brown; apex of fore wing tinged with buffy brown.

Expanse, ♂, 33 mm.

1 ♂ (holotype), Mt. Makiling, Luzon, Philippines (*P. I. Baker*).

May be placed near to *Cobanilla plumbacea* Swinhoe.

Lymantria elassa, sp. n. (Pl. XIV. fig. 26.)

♂. Palpus, head, body, and legs tawny olive mixed with pinkish buff; the outer side of the palpus and the antennal shaft darker, pectinations of antenna pinkish buff; a collar of peach-red between head and thorax, present only in a small proportion of specimens. Fore wing sayal-brown irrorated with bistre; a bistre rectangular mark on the discocellulars and a rather poorly defined bistre streak below the junction of vein *Cu*2 with the cell; an indistinct crenate subterminal fascia, points on the veins, concavities terminad, the concavities filled in with pinkish buff; fringe pinkish buff, marked with bistre between the vein-ends. Hind-wing pinkish buff, shading gradually to a darker colour in the terminal area; fringe pinkish buff. Under side of both wings and fringes pinkish buff; fringe of fore wing marked between the vein-ends with bistre; a dark spot on the discocellulars of the hind wing and a faintly indicated postmedial fascia.

♀. Resembles the ♂.

Expanse, ♂♂ 27-34 mm., ♀♀ 43-45 mm.

1 ♂ (holotype), 1 ♀ (allotype), 27 ♂♂, 2 ♀♀ (paratypes), Ya-chiao-ling, China, July-October 1922 (*C. T. Bowring*); ex Joicey collection.

This species is nearly related to *Lymantria albolunulata* Moore, with which it has previously been confused. In *L. elassa* there is no trace of pink on the abdomen, the wing-expanse is very much less, and the pattern on the fore wing less well defined. Slight differences in the male genitalia confirm the specific distinction.

Dura niveus percnoptera, subsp. n.

♂ and ♀. Distinguished from *Dura n. niveus* by the colour of the upper side of hind wing, which in the present subspecies is sayal-brown to tawny olive, becoming somewhat lighter towards the termen in the male. There is a series of terminal interneural spots on the fore wing, and similar spots at the angle of the hind wing on each side of vein *Cu*1.

Expanse, ♂ 68 mm., ♀♀ 95-101 mm.

1 ♂ (holotype), 1 ♀ (allotype), 1 ♀ (paratype), Mount Kunupi, Menoo Valley, Weyland Mountains, Dutch New Guinea, 6000 ft., November-December 1920 (*C., F., and J. Pratt*); ex Joicey collection.

Dasychira dehra, sp. n. (Pl. XIV. fig. 2.)

♂. Palpus pinkish buff, on the outer side clove-brown. Antennal shaft white, irrorated sparsely with fuscous; pectinations ochraceous-tawny. Head light gull-grey, the eye bordered with clove-brown. Thorax, basal segments of abdomen, and anal tuft light gull-grey, remainder of abdomen buckthorn-brown. Pectus, venter, and legs light gull-grey mixed with whitish, each segment of the tibiæ marked on the outer side with fuscous-black. Fore wing light gull-grey, shaded over the distal two-thirds with light drab; the whole wing lightly irrorated with fuscous-black; a faint antemedial fascia indicated by an increase in the irroration; discocellulars edged with fuscous; traces of a dark subterminal fascia, broken at the veins; fringe light drab mixed with fuscous-black. Hind wing and fringe whitish, shaded heavily with fuscous; the area from base to anal angle, below the cell, tinged with clay-colour. Under side of fore wing and fringe light gull-grey, shaded, excepting the area along the inner margin, with fuscous; a darker shading of fuscous in the cell, a fuscous spot on the discocellulars, and a faintly indicated darker postmedial fascia. Under side of hind wing and fringe light gull-grey, shaded with fuscous; a fuscous spot on the discocellulars, a faintly indicated darker postmedial fascia; the area from base to anal angle, below the cell, tinged with clay-colour.

♀. Strongly resembles the ♀ of *Dasychira grotei* Moore, but with a greyer fore wing, almost without markings.

Expanse, ♂♂ 48–50 mm., ♀ 74 mm.

1 ♂ (holotype), 6th February, 1937, defoliating *Shorea robusta*, 1 ♂ (paratype), 25th December, 1936, and 1 ♂ (paratype), 26th December, 1937, on *Quercus serrata*, all taken by J. C. M. Gardner; 1 ♀ (allotype), ex larva on Guava, 2300 ft., emerged 19th January, 1937, 1 ♂ (paratype), assembled at 3 P.M. to ♀, 2300 ft., 20th January, 1937, and 1 ♂ (paratype), at light, 2300 ft., 7th February, 1937, all taken by J. A. Graham; Dehra Dun, United Provinces.

Closely related to *Dasychira grotei* Moore, but distinguished in the ♂ by the darker hind wing and almost unicolorous fore wing.

The series, with the exception of one paratype, has kindly been presented to the British Museum by the Forest Research Institute, Dehra Dun.

Dasychira aphrasta, sp. n. (Pl. XIV. fig. 9.)

♂. Palpus light buff, on the outer side Prout's-brown. Antennal shaft whitish, sparsely irrorated with buckthorn-brown; pectinations ochraceous tawny. Head, and thorax above and beneath, whitish mixed with buckthorn-brown, giving a grey appearance. Abdomen above and beneath buffy brown. Legs whitish, mixed on the inner side of the fore tibia with Prout's-brown. Fore wing whitish, mixed sparsely over the whole wing with buckthorn-brown, and with the following markings in the same colour:—a subbasal fascia, not reaching the inner margin; a double antemedial fascia, crenate, running almost straight across the wing from the costa at one-third to the inner margin at one-half; a spot on the centre of the discocellulars; a double postmedial fascia, more heavily marked in the costal area, crenate, points on the veins, concavities terminad, bowed with convexity terminad from costa to vein *Cu*2, thence oblique outwardly to the inner margin; subterminal and preterminal fasciæ indistinct and irregular; fringe whitish, with a series of snuff-brown spots interneurally. Hind wing snuff brown; a darker spot on the discocellulars; fringe whitish, with a series of snuff-brown spots interneurally. Under side of fore wing pale pinkish buff; a dark spot on the discocellulars, and a shading of snuff-brown over the cell and costal area, not reaching the termen; fringe as on upper side. Under side of hind wing pale pinkish buff; a dark spot on the discocellulars, and a snuff-brown subterminal fascia, not reaching the costa and inner margin; fringe as on upper side.

♀. Resembles the ♂, but with a much lighter hind wing, showing a rather faint subterminal fascia, parallel with the termen and not reaching the costa and inner margin.

Expanse, ♂♂ 44–46 mm., ♀♀ 56–63 mm.

1 ♂ (holotype), 1 ♀ (allotype), 2 ♂♂ and 1 ♀ (paratypes), Khasi Hills, Assam, ex Swinhoe and Doncaster collections; 2 ♀♀, Jaintia Hills, Assam, ex Swinhoe collection. A ♂ from Kegelle, Ceylon, November 1908 (*F. M. Mackwood*), is also referable to this species.

This species has previously been confused with *Dasychira angulata* Hampson. The angle on the termen of the fore wing at vein *Cu*1 is just discernible, but both wings are considerably broader than in *D. angulata*, and colour and pattern offer further distinctions. *D. aphrasta* may be placed near to *Dasychira zelotica* Collenette.

Aroa gyroptera, sp. n. (Pl. XIV. fig. 28.)

♂. Palpus ochraceous-buff, on the outer side snuff-brown. Antenna, head, and thorax snuff-brown, mixed on the tegula with ochraceous-buff. Abdomen Dresden-brown. Pectus and venter pinkish buff, legs pinkish buff to ochraceous-buff, mixed with snuff-brown. Fore wing snuff-brown; a broad but poorly defined light buff postmedial fascia, somewhat broken at the veins, from the costa at three-fourths to the inner margin at two-thirds; fringe snuff-brown. Hind wing, under side of both wings, and fringes Dresden-brown.

Expanse, ♂♂, 27–28 mm.

1 ♂ (holotype) and 3 ♂♂ (paratypes), Haight's Place, Pauai, subprovince Benguet, Luzon, 7000 ft, November and December 1912 and July 1913 (*A. E. Wileman*).

Aroa asthenes, sp. n. (Pl. XIV. fig. 15.)

♂. Palpus and antennal shaft pale orange-yellow; pectinations of antenna benzo-brown. Head, thorax, and abdomen orange-buff, sparsely mixed with Brussels-brown. Pectus, venter, and legs light buff to warm buff. Fore wing light orange-yellow; basal third of wing Brussels-brown mixed to some extent with the ground-colour; distal third of wing Brussels-brown, with a rounded spot of the same colour on the discocellulars, touching the dark area; for the shape of the medial light-coloured area, see figure; fringe Brussels-brown. Hind wing Brussels-brown; the whole area of the cell and from the cell to the costa, together with the inner marginal area, light orange-yellow; fringe Brussels-brown mixed with light orange-yellow. Under side of both wings and fringes Brussels-brown, the interior of each wing, from the base up to or beyond the discocellulars, light orange-yellow.

Expanse, ♂♂, 22–23 mm.

1 ♂ (holotype) and 4 ♂♂ (paratypes), Palawan, Philippines (*Doherty*), ex Joicey collection.

Resembles in facies *Aroa nigrocrocea* Walker. Vein *R*5 in the fore wing is absent.

Pantana hitamputeh, sp. n. (Pl. XIV. fig. 19.)

♂. Palpus orange-buff. Antenna sepia. Head, thorax, and abdomen Saccardo's-umber. Pectus and venter whitish, legs missing in the type. Fore wing sepia; a triangular patch of white, the edges shading gradually into the ground-colour, reaching from the centre of the cell to the discocellulars, and almost to the inner margin at three-fourths; three small but prominent fuscous-black spots, touching the outside of the cell between the origin of veins *M*2, *M*3, *Cu*1, and *Cu*2, and a further spot inside the cell, opposite the origin of vein *Cu*1; fringe sepia. Costal area of hind wing, down to a line running through the centre of the cell and thence to the junction of vein *M*2 with the termen, clove brown; central portion of the wing, down to a line from the middle of the cell and along vein *Cu*2 almost to the termen, white; remainder of the wing, including the lower part of the basal half of the cell and the terminal area up to vein *M*2, drab; fringe drab, and in apical area clove brown. Under side of fore wing and fringe as on upper side, but the white area somewhat larger and the fuscous-black spots not present. Under side of hind wing white, apical area clove-brown; fringe white, and in apical area clove-brown.

Expanse, ♂, 35 mm.

1 ♂ (holotype), Bukit Kutu, Malay States, 3300 feet (*A. R. Sanderson*).

The insect described above is evidently closely related to *Pantana adara* Moore (Java), of which I have seen only the type ♀. The ♂, however, is described by Strand in Seitz as having "greyish-pink, unmarked fore wings and white hind wings."

Pantana albifascia brepha, subsp. n. (Pl. XIV. fig. 23.)

♂. Considerably smaller than *Pantana a. albifascia* Walker (Darjiling); a circular spot on the distal side of the discocellulars of the fore wing, slightly darker than the surrounding ground-colour; inner marginal area of hind wing, up to the lower margin of the cell and vein *Cu*1, lighter in colour than the remainder of the wing.

Expanse, ♂, 31 mm.

1 ♂ (holotype), Muang Huang, Laos, French Indo-China, 31st March, 1932 (*Dr. A. Kerr*).

EXPLANATION OF PLATE XIV.

Fig. 1. *Euproctis hagna*, sp. n., holotype ♂.
Fig. 2. *Dasychira dehra*, sp. n., holotype ♂.
Fig. 3. *Euproctis chlorogaster*, sp. n., holotype ♂.
Fig. 4. *Redoa dialitha*, sp. n., holotype ♀.
Fig. 5. *Euproctis korinchi*, sp. n., holotype ♂.
Fig. 6. *Pellucens zeugosticta*, sp. n., holotype ♀.
Fig. 7. *Euproctis tanaoptera*, sp. n., holotype ♀.
Fig. 8. —— *peronogaster*, sp. n., holotype ♂.
Fig. 9. *Dasychira aphrasta*, sp. n., holotype ♂.
Fig. 10. *Euproctis leontocephala*, sp. n., holotype ♀.

Fig. 11. *Euproctis mackwoodi*, sp. n., holotype ♂.
Fig. 12. — *oonophora*, sp. n., holotype ♂.
Fig. 13. — *kunupi*, sp. n., holotype ♂.
Fig. 14. *Leucoma wiltshirei*, sp. n., holotype ♂.
Fig. 15. *Aroa asthenes*, sp. n., holotype ♂.
Fig. 16. *Euproctis phaulida*, sp. n., holotype ♂.
Fig. 17. — *khasi*, sp. n., holotype ♂.
Fig. 18. *Arctornis xuthocraspeda*, sp. n., holotype ♂.
Fig. 19. *Pantana hitamputeh*, sp. n., holotype ♂.
Fig. 20. *Euproctis asteroides*, sp. n., holotype ♀.
Fig. 21. — *brachycera*, sp. n., holotype ♂.
Fig. 22. *Cobanilla psola*, sp. n., holotype ♂.
Fig. 23. *Pantana albifascia brepha*, subsp. n., holotype ♂.
Fig. 24. *Euproctis leucozona*, sp. n., holotype ♂.
Fig. 25. — *dolichocera*, sp. n., holotype ♂.
Fig. 26. *Lymantria elassa*, sp. n., holotype ♂.
Fig. 27. *Euproctis hemixantha*, sp. n., holotype ♂.
Fig. 28. *Aroa gyroptera*, sp. n., holotype ♂.

XLV.—*Entomological Expedition to Abyssinia*, 1926–7 : *Coleoptera*, Bostrychidæ. Par PIERRE LESNE, Laboratoire d'Entomologie. Muséum National d'Histoire Naturelle, Paris.

LES Bostrychides recueillis par MM. Hugh Scott et J. Omer-Cooper au cours de leur voyage en Abyssinie sont peu nombreux puisqu'ils appartiennent à six espèces seulement ; mais deux de celles-ci étaient encore inédites, dont une forme le type d'un genre nouveau, et dont l'autre permet de définir avec exactitude le mode de variation sexuelle du groupe auquel elle appartient. Ces récoltes apportent donc un appoint notable à la connaissance des Bostrychides. On y a ajouté trois autres espèces, dont les spécimens ont été recueillis par M. H. Uhlenhuth à Dire Dawa en 1935 ; le total des espèces d'Abyssinie énumérées ici est ainsi porté à neuf. Toutes font partie des collections du British Museum (où se trouvent les *types* des espèces nouvelles) ; elles m'ont été aimablement communiquées par M. le Dr. Hugh Scott.

Tribu **BOSTRYCHINI**.—Subtribu **Bostrychina**.

1. ***Bostrychopsis tetraodon*** Fairm., Le Nat. v. 1883, p. 205 ; Lesne, Ann. Soc. ent. France, lxvii. pp. 529, 530, figs. 143, 144, 1898.

Loc. Abyssinie : " between Jem-Jem Forest and Wouramboulchi, 8000–9000 feet, 8–11. x. 1926, 2 ♂, 1 ♀ (*Omer-Cooper*)."

Cette espèce ne se rencontre qu'en Abyssinie et dans quelques régions circonvoisines, en Erythrée, en Somalie et dans le Soudan égyptien. Chez elle, la seule forme mâle connue est un mâle céphalogyne et non pas un mâle hétéromorphe comme je l'ai dit autrefois (*l. c.*, p. 526). La présence, chez ce mâle, de spinules frontales qui, par suite de leur extrême petitesse, m'avaient tout d'abord échappé, et celle d'une carène s'élevant sur la suture fronto-clypéale, caractères tous deux essentiellement femelles, en fournissent la preuve, comme aussi la découverte du *B. optata*, décrit plus loin, qui est affine du *tetraodon* et dont le mâle est, lui, un mâle hétéromorphe typique.

Il faut noter ici que, chez une troisième espèce du groupe, le *B. villosula* Lesne, de l'Afrique tropicale orientale et australe, le seul mâle connu est, comme celui du *tetraodon*, un mâle céphalogyne.

2. *Bostrychopsis optata*, sp. n.

Long. 11–12 mm. Espèce extrêmement voisine du *B. tetraodon* Fairm., dont elle a le facies. Il est cependant facile de l'en distinguer à l'aide des caractères indiqués dans le tableau suivant :—

B. tetraodon.	*B. optata.*
♂ (céphalogyne). Front portant de très courts poils spinuliformes, bruns. Région de la suture fronto-clypéale cariniforme.	♂ (hétéromorphe). Pas de spinules frontales. Suture fronto-clypéale simple, normale, finement marquée, mais bien apparente, de niveau avec les téguments voisins et nullement cariniforme.
♀. Front couvert de poils spinuliformes assez denses, d'un brun foncé. Carène fronto-clypéale plus courte, plus arquée, plus élevée et couverte de soies plus denses. Bord antérieur du pronotum droit.	♀. Front couvert de longues soies blondes dressées, sans spinules. Carène fronto-clypéale plus longue, faiblement arquée. Bord antérieur du pronotum légèrement échancré.

Le mâle du *B. optata* se distingue de celui du *B. villosula* Lesne, outre les caractères fournis par la tête (c'est à dire notamment par l'épistome brillant et ponctué comme le front et par les yeux moins gros), par ses cornes prothoraciques plus longues, par la présence d'un sillon médian au pronotum, par la ponctuation des élytres plus serrée, les dents de la déclivité apicale des élytres non cariniformes, le bord inféro-apical des élytres nettement denté, etc. Sa connaissance offre cet intérêt de montrer que, dans le petit groupe d'espèces se rangeant auprès du *B. tetraodon*, la pœcilandrie métamérique se manifeste à la manière habituelle quoique avec une moindre amplitude que dans les groupes des *B. tonsa* Imh. et *B. uncinata* Germ.

Loc. Abyssinie : " between Jem-Jem Forest and Wouramboulchi, 8000–9000 feet, 8–11. x. 1926, 2 ♂, 1 ♀ (*Omer-Cooper*) ; Jem-Jem Forest, ca. 8000 feet, 4–10. x. 1926, 1 ♂ (*Scott*)."

Déjà en 1897–98 la Mission de Bonchamps avait trouvé en Abyssinie, au sud du 10° lat. N., un exemplaire mâle de la même espèce. Cet individu avait été déposé au Muséum de Paris ; mais, en l'absence de la femelle, je n'avais pu décider si il s'agissait d'une forme spécifique nouvelle plutôt que d'une seconde forme mâle du *B. tetraodon*.

Fig. 1.

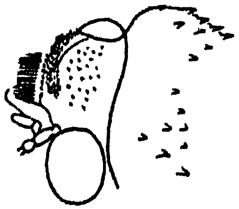
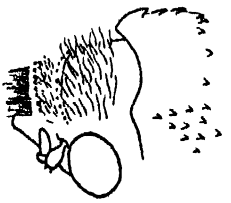


Fig. 2.



Figs. 1 et 2.—Tête et bord antérieur du prothorax, vus de trois-quarts, chez le *Bostrychopsis tetraodon* Fairm., ♀ (fig. 1), et chez le *B. optata*, sp. n., ♀ (fig. 2).

3. ***Bostrychoplites cornutus*** Ol. ; Lesne, Ann. Soc. ent. France, lxvii. p. 572, figs., 1898.

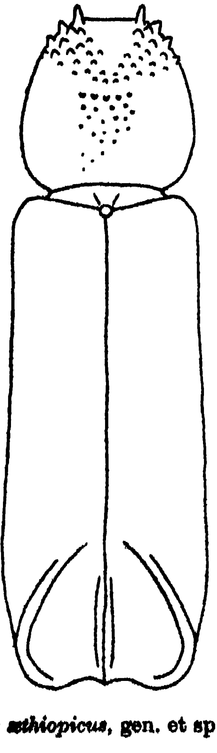
Loc. Abyssinie : Dire Dawa, ca. 4500 pieds, iii.–iv. 1935, 3 exemplaires (*Uhlenhuth*). Très répandu dans l'Afrique tropicale et dans l'Afrique du Sud, connu aussi du sud-ouest de l'Arabie, etc.

4. ***Calopertha costatipennis*** Lesne, Ann. Soc. ent. France, lxxv. p. 458, fig. 503, 1906.

Loc. Abyssinie : Dire Dawa, ca. 4500 pieds, iii. 1935, 1 ex. (*Uhlenhuth*). Connu seulement de l'Abyssinie centrale et méridionale et du Pays Somali.

près des bords de la déclivité apicale où elle devient plus forte, la déclivité elle-même fortement ponctuée sauf dans la partie inférieure, et limitée latéralement par une côte arquée qui rejoint presque la suture en avant. Bord latéral de l'élytre simple, non échancré au tournant apical. Angles suturaux marqués chacun d'une profonde impression fovéiforme, nullement déhiscents, les élytres étant conjointement arrondis à l'apex. Abdomen finement ponctué, son 3e sternite apparent triangulaire, terminé au milieu du bord postérieur par deux fortes dents plates légèrement écartées. 4e sternite largement et profondément échancré au milieu de son bord postérieur, fortement ascendant sur les côtés, où il est hérissé de longues soies rousses. 5e sternite visible seulement sur les côtés,

Fig. 3.



Amintinus æthiopicus, gen. et sp. n., ♀.

où il forme comme deux volets lisses et brillants dont le plan est subparallèle au plan médian du corps. Ces 4e et 5e sternites visibles (urosternites VI et VII) paraissent être conjointement à demi réversibles, c'est à dire qu'ils semblent pouvoir se dresser ensemble du côté dorsal suivant un plan plus ou moins perpendiculaire au complexe formé par les sternites III–V, caractère qui indique une affinité avec les *Xylion*.

Fig. 4.

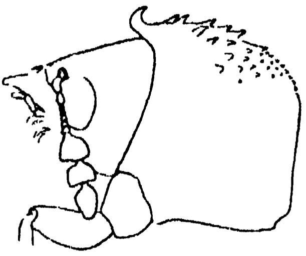
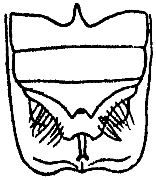


Fig. 5.



Amintinus æthiopicus, gen. et sp. n., ♀.

Fig. 4.—Tête et prothorax, de profil.

Fig. 5.—Abdomen et extrémité des élytres, vus en dessous.

Les tibias et les tarses portent de longues soies au côté interne.

Loc. Abyssinie : Jem-Jem Forest, x. 1926, ainsi qu'entre Jem-Jem et Wouramboulchi, 8000–9000 pieds, 8–11. x. 1926, 2 ♀ (*Omer-Cooper*).

[Je rapporte au même genre l'espèce suivante qui serait originaire du Sikkim :—

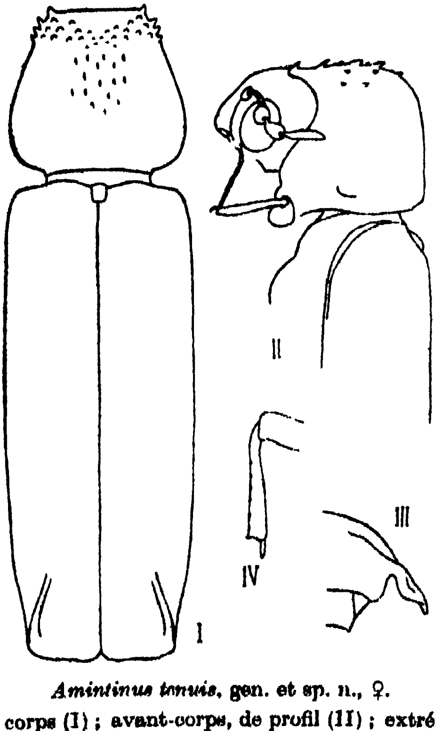
Amintinus tenuis, sp. n. (♀).

Long. env. 3·1 mm. ; largeur aux épaules env. 0·8 mm. Corps très étroit, parallèle, le prothorax étant court et élargi en arrière, et les élytres légèrement rétrécis avant l'apex.

Tête, poitrine et abdomen bruns ; prothorax d'un brun rougeâtre ; élytres d'un roux pâle, légèrement rembrunies en arrière. Antennes et pattes testacées.

Front régulièrement convexe. Yeux gros, fortement détachés des tempes. 2e article des antennes allongé, presque aussi long que le premier. Mandibule gauche tronquée à l'apex. Aire suscéphalique inerme du pronotum plus longue que large. Pas de denticules interposés entre les dents de la râpe prothoracique. Aire postérieure du pronotum présentant, au milieu, de très fines carènes longitudinales. Ponctuation des élytres extrêmement fine dans sa région medio-postérieure, assez forte près de la base. Déclivité apicale fortement ponctuée dans sa moitié supérieure, limitée latéralement par une courte carène presque droite convergeant légèrement vers la suture en avant. Bord latéral de l'élytre échancré en arrière, immédiatement avant le tournant apical, l'échancrure étroite, plus profonde que large, précédée d'un large et court lobe du bord externe

Fig. 6.



Amintinus tenuis, gen. et sp. n., ♀.
Contour du corps (I) ; avant-corps, de profil (II) ; extrémité apicale des élytres, de profil (III) ; tibia antérieur, face postérieure (IV).

de l'élytre. Angles suturaux déhiscents, largement arrondis. Abdomen imponctué, ses 3e et 4e sternites apparents normaux, le dernier toutefois armé, au milieu de son bord postérieur, d'une courte épine dressée ; 5e sternite offrant une large et profonde fossette transverse, ovalaire. Tibias postérieurs sans soies dressées ; 2e article des tarses postérieurs très long.

Loc. Un seul exemplaire (♀) connu, provenant probablement du Sikkim (Muséum de Paris).

Les caractères les plus remarquables de cet insecte, caractères qui sont certainement sexuels, sont ceux offerts par le bord externe de l'élytre et par les 4e et 5e urosternites apparents. La forme générale du corps est particulièrement grêle.]

Subtribu **Apatina.**

9. *Apate terebrans* Pall. ; Lesne, Ann. Soc. ent. France, lxxviii. p. 503, figs., 1909.

Loc. Abyssinie : " plain north of Lake Zwai, 5500–6000 feet, 1. xi. 1926, 1 ♀ (*Scott*) ; between Lake Zwai and Lake Hora Abjata, 15, 16. xi. 1926, 2 ♀ (*Omer-Cooper*)." Répandu dans les parties chaudes de l'Afrique ainsi que dans le sud de l'Arabie.

XLVI.—*Nouveaux* Apion (*Col.*, Curcul.) *du Congo Belge.*

Par L. Burgeon (Tervueren).

Apion (*Conapion*) *cockerelli*, sp. n.

Longueur sans le rostre 2·8 mm.

Ressemble à *familiare* Fst., de taille moindre, le rostre du ♂ plus rétréci devant, celui de la ♀ bien moins long, stries élytrales mieux marquées, les intervalles sans rangées de gros points, etc.

D'un noir terne sur l'avant du corps, luisant aux élytres qui ont un faible reflet métallique ; corps glabre sauf le dessous et les pattes où la face avant des hanches antérieures est revêtue de poils jaunâtres abondants.

Tête plus large que longue, yeux grands, saillants, tempes guère plus longues qu'eux ; front assez large entre les yeux, portant une carène axiale et un pli de chaque côté, deux sillons en V parfois visible à la base du rostre ; vertex lisse sur une zone étroite à la base. Rostre plus court que celui de *familiare*, celui du ♂ légèrement élargi à l'insertion des antennes, plus attenué devant, assez fortement sculpté, ayant une partie lisse au dessus de l'insertion et l'apex luisant ; rostre de la ♀ notablement moins dimorphe que chez *familiare*, moins long et en cylindre moins grêle après l'insertion. Antennes insérées un peu en-deçà de la mi-longueur du rostre, assez minces, non hérissées de poils ; scape de peu plus long que le premier article du funicule, celui-ci plus épais et plus court que le 2, les suivants diminuant de longueur sans devenir transversaux, massue assez longue. Pronotum ressemblant à celui de *familiare* pour le contour et la ponctuation, apex plus étroit que la base, côtés assez largement bombés au milieux, sinués en avant et en arrière, striole antéscutellaire absente, une ligne lisse dans son axe. Elytres en U assez court, beaucoup plus larges que le thorax aux épaules, hautement bombés longitudinalement ; stries plus larges que chez *familiare*, légèrement convergents vers l'écusson à la base, parallèles à la suture plus loin, 1, 2 et 9 approfondies à l'apex et s'y rejoignant ; intervalles moins plans, assez fortement sculptés (outre la microsculpture, de petites rides transverses et deux files de très petits points), sans les grands points de *familiare*, ils sont luisants sur le disque, mats à l'arrière. Fémurs postérieurs arrivent à l'apex des élytres, pas de dimorphisme aux tarses.

Au Musée de Tervueren : rio Kasai-Lunene (ii. 32, *Orulaet*) ; source Kimilolo près Elisabethville (vi. 20, *Sporcy*). Au Musée Britannique : Elisabethville (ix. 31, *Prof. T. D. A. Cockerell, Miss A. Mackie*).

Apion (*Rhinapion* ?) *mackiesæ*, sp. n.

Longueur 1·2–2·8 mm.

Diffère des autres *Rhinapion* par la pilosité bien visible du corps et par la strie 2 des élytres non reliée à 9 à l'apex.

Noir assez luisant aux élytres, de fins poils gris assez courts dessus et dessous, plus apparents au pronotum qu'aux élytres, ne s'agglomérant pas au point de faire des taches aux côtés du sternum.

Tête un peu plus longue que large ; yeux grands allongés, non saillants, l'espace entre eux large, creusé, sans carène médiane, un faible sillon transversal contre le bord arrière des yeux, sans tubercule épineux dessous ; vertex lisse, moins long que l'œil. Rostre épais, un peu moins long que tête plus pronotum chez le ♂, plus long ♀, peu courbé sauf à l'apex même, cylindrique jusqu'à l'insertion des antennes, puis légèrement atténué, en profil, l'épaisseur augmente en dessous à l'insertion, elle se réduit chez le ♂ à l'apex par une courbure accentuée à la face supérieure, une carène à la face latérale va de l'œil au delà de l'insertion, tout le dessus aciculé, assez luisant après l'insertion, surtout à l'apex ; rostre de la ♀ plus long que celui du ♂, parfois très long, un peu moins épais et, vu de profil, ayant une courbure plus régulière à l'apex. Antennes insérées vers la mi-longueur du rostre, assez épaisses ; scape plus long que le premier article du funicule, celui-ci de la longueur du 2, mais plus épais, 2 et suivants munis d'un verticille de petits poils hérissés, les articles à partir du 4 moniliformes, le dernier transversal ; massue en court et large bouton, bien séparée à la base, pointue au bout. Pronotum conique, plus large à la base que long, côtés très obliques, brièvement mais profondément échancrés avant l'apex, non sinués avant la base ; un sillon assez long devant l'écusson ; surface à ponctuation régulière, ni grosse, ni serrée, les points munis de petits poils dirigés vers l'avant. Elytres assez courts, de forme large, notablement plus larges que le pronotum à la base ; bombement longitudinal moindre que le demi-cercle ; côtés non évasés vers l'arrière, apex largement arrondi ; stries assez larges, profondes, ponctuées, parallèles à la suture ; 1 et 2 approfondies à l'apex ; 1 rejoignant 9, 2 se reliant à 7, 8 ; intervalles presque plans, assez soulptés, portant chacun une ou deux files de très petites écailles. Pattes robustes, fémurs postérieurs dépassent un peu l'apex des élytres ; des poils gris assez longs sur les pattes ; une frange de poils noirs au côté inférieur des tibias ; pas de dimorphisme.

Au Musée de Tervueren : Kapiri (ix., x. 12, ***Mission Agricole***). **Au Musée Britannique :** Elisabethville (ix. 31, ***Miss A. Mackie***) ; **Biano** (viii. 31, ***Ogilvie***).

L'espèce se rapproche des *Rhinapion* par le facies et par la forme du pronotum. On ne rencontre pas dans ce groupe des antennes verticillées, mais le rostre à peine rétréci devant de la ♀ se voit chez *nigerrimum* Wgn. (*gibbipenne* Fhrs.) ; cette espèce diffère, à première vue, par la pilosité presque nulle, par les stries des élytres bien plus tenues, se rejoignant autrement à l'apex, etc.

Apion (*Pseudopiezotrachelus*) *brédoi*, sp. n.

Longueur 1·2–2 mm.

Proche de *ripicola* Hartm., d'un noir peu luisant, de forme plus robuste, le rostre plus épais dans les deux sexes, la sculpture du pronotum plus forte, les stries des élytres plus marquées.

Noir, le dessus mat, glabre.

Tête assez large, yeux petits, saillants, front ayant entre eux près de deux largeurs d'œil, portant une faible carène axiale et un petit pli contre chaque œil ; vertex lisse en arrière, portant quelques lignes transverses très fines, séparé par un faible sillon, marqué en dessous d'un petit tubercule à son bord avant, gorge bombée. Rostre du ♂ n'ayant pas la longueur de la tête plus le pronotum, faiblement courbé, notablement plus épais que chez *ripicola*, cylindrique jusqu'à l'insertion des antennes, légèrement atténué de là à l'apex, sculpté de bout en bout, chagriné dans la première partie, moins mat après l'insertion et à ponctuation aciculé, un petit espace lisse au dessus de l'insertion ; rostre de la ♀ plus long, plus grêle que celui du ♂, quoique plus épais que chez *ripicola* ♀, visiblement atténué après l'insertion, portant de petits points dans cette seconde partie, notablement moins luisant que chez *ripicola*. Antennes insérées vers le tiers basilaire du rostre ; scape, premier article du funicule et massue plus gros que chez *ripicola*, scape un peu plus long que le premier article, celui-ci plus épais que le suivant et environ de même longueur, les suivants raccourcis, massue bien séparée à la base. Pronotum conique, aussi long que large à la base, côtés légèrement arrondis vers le milieu, peu profondément sinués avant l'apex ; base et apex presque coupés droites ; une striole bien marquée et assez longue devant l'écusson ; surface couverte de petits points rapprochés. Elytres en large ovale, notablement plus larges que le pronotum à la base ; calus saillants ; côtés évasés jusque vers le milieu, la largeur maxima un peu après ; bombement longitudinal, comme chez *ripicola*, moindre que le demi-cercle, ne continuant pas celui du pronotum ; stries larges et profondes, catenulées parallèles à la suture, 1 reliée à 9 à l'apex, sans approfondissement notable, un bourrelet au côté externe de 9 prolongé ; intervalles légèrement bombés, les premiers ayant l'aspect de côtes par suite de la profondeur des stries, plus larges qu'elles, mats, très sculptés, à fort grossissement on y voit, outre la microsculpture, de petits sillons transverses. Dessous imponctué. Pattes assez courtes, sans dimorphisme ; fémurs postérieurs n'arrivant pas à l'apex des élytres.

Espèce de Kivu.

Au Musée du Congo : Butembo-Musai (vii. 35, *Brédo*) ; Goma (x. 32, *Burgeon*) ; Tshibinda (xi.32, *id.*) ; Rutshum (i. 37, *Ghesquière*). Musée Britannique ; Tshibinda (viii. 31, *Prof. T. D. A. Cockerell*, *Mrs. Ogilvie*, *Miss Mackie*).

XLVII.—*Trois* Bruchus *L. nouveaux des Indes* (*Coléoptères*). Par M. Pic.

Bruchus bilineatopygus, sp. n.

Oblongo-elongatus, antice et postice attenuatus, rufescens, capite plus minusve pygidioque diverse nigris aut piceis, elytris externe diverse piceo notatis, membris rufis, antennis apice brunneis. Capite robusto, medio elevato, oculis grandis, prominulis ; antennis brevibus, gracilibus, apice latioribus ; thorace non transverso, antice valde attenuato, ruguloso et pupillato-punctato, medio griseo lineolato, in disco medio et postice albo bimaculato ; scutello transverso, albo ; elytris sat elongatis, postice attenuatis, striato-punctatis, diverse albo tessellatis ; pygidio elongato, longitudinaliter tri- et transverse uni-albolineato ; pedibus posticis paulo dentatis.

Long. 4 mm.

Espèce pouvant prendre place près de *B. schroderi* Pic var. *importatus* Pic (qui est plus aplati et sans mouchetures sur les élytres, d'une coloration roussâtre avec un revêtement uniforme étendue même sur le pygidium) bien caractérisé par les mouchetures grises allongées des élytres et les bandes longitudinales et transversale pubescentes sur le pygidium.

INDIA : Dehra Dun[*].

Bruchus gardneri, sp. n.

Minutus, oblongo-subovatus, niger, griseo uniformiter aut fere uniformiter griseo pubescens, antennis pedibusque 4 anticis testaceis. Capito robusto, oculis validis ; antennis parum elongatis, sat crassis, thorace non transverso, obconico, dense ruguloso-punctato , scutello brevi ; elytris sat brevibus, postice attenuatis, striato-punctatis, indistincte aut paulo albo tessellatis . pygidio dense albo pubescenti ; femoribus posticis inermibus.

Long. 1·5 mm environ

Voisin de *B. nalandus* Pic, s'en distingue par les élytres non marqués de roux au sommet et les pattes postérieures noires.

INDIA : Dehra Dun.

Bruchus stevensi, sp. n.

Oblongo-subovatus, niger, diverse griseo pubescens, elytris parte griseo aut fulvo alternate pubescentibus, antennis ad basin, pedibus anticis et intermediis et femoribus posticis pro parte testaceis. Capite elongato, dense albo pubescente, oculis grandis valdo prominulis ; antennis longissimis ; thorace elongato, antice valde attenuato, fortiter et dense punctato, diverse pubescente ; scutello elongato et angustato, griseo pubescente ; elytris sat brevibus, postice attenuatis, striato-punctatis, non uniformiter pubescentibus, pro parte nigro notatis ; pygidio dense albo pubescente ; femoribus posticis minute dentatis.

Long. 2·5–3 mm.

Sans doute voisin de *B. cinereovarius* Mots. et s'en distinguant (ex description) par le revêtement différent des élytres, le thorax sans bandes foncées et les 4 tarses antérieurs testacés.

INDIA.

Le type, originaire de Kurseong, est dans la collection Pic. L'espèce a été recueillie au Sikkim par A. Stevens, à qui elle est dédiée, et à Dehra Dun par Gardner.

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[*] Communiqué, ainsi que les suivants, par le Imperial Institute of Entomology. Des paratypes de *B. bilineatopygus* et *gardneri* se trouvent dans ma collection.

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XLVIII.—*Results of the Oxford University Expedition to Sarawak (Borneo)*, 1932. *Diptera*, Trypaneidæ. By F. A. PERKINS, B.Sc.Agr., Lecturer in Entomology, University of Queensland.

[Plate XV.]

THIS collection was made by Messrs. B. M. Hobby and A. W. Moore, and consists of 51 specimens belonging to seven genera. The excellent condition of the specimens makes it possible to solve one or two problems of synonymy, and the opportunity is taken of re-describing a species which has caused considerable confusion in the past. One species and a variety are described as new. Three subfamilies are represented in the collection, but it is rather surprising that no species of Dacinæ were collected.

Subfamily *ADRAMINÆ*.

Of this subfamily there is only one species, the well-known *Adrama determinata* Walk., an important pest of tea seeds. It is represented by two males and one female, from the foot of Mt. Dulit, junction of the rivers Tinjar and Lejok, 28. viii. 1932 (cultivated land, now waste); and 1 male and 1 female, Mt. Dulit (4000 ft.), Oct. 1932 (primary moss forest).

Subfamily *TRYPETINÆ*.

This subfamily is represented by five large handsome species, belonging to the following genera :

Genus RIOXA Walk., 1857 *a*, p. 35.

Of this genus, there is one species, *R. lanceolata* Walk., the genotype, originally recorded from Singapore, and also from Borneo, Sumatra, and Java. Three males from Mt. Dulit, Dulit trail, 9. ix. 32 (undergrowth, old secondary forest) ; Mt. Kalulong (1500 ft.), 7. xi. 32 (primary forest) ; foot of Mt. Dulit, junction of rivers Tinjar and Lejok, 5. x. 32 (undergrowth, old secondary forest).

Genus SOPHIRA Walk., 1857 *a*, p. 34.

Only one species, *S. limbata* End., previously recorded from Sumatra. This fine species is represented by 11 females from Mt. Dulit, junction of rivers Tinjar and Lejok, Aug. 1932 (on bark of felled trees) ; and Mt. Dulit 4500 ft.), 14. x. 32 (moss forest).

Genus COLOBOSTROTER End., 1911, p. 445.

This peculiar genus was erected in 1911 by Enderlein for *pulchralis*, the only known species of the genus. It is doubtful whether it should be placed in the subfamily Trypetinæ. In the absence of *pvt.*, *hm.*, *prst.*, and *dc.* bristles, it is more like a species of the subfamily Dacinæ. On the other hand, the plumose arista, the wing-venation, and the wing-pattern indicate its relationship to species of Trypetinæ. It differs from species of both subfamilies in having no *s.or.* outer *vt.*, *pt.*, and *st.* bristles, the presence of a short R_3, and in the thick covering of very long hairs on the thorax and abdomen. The fact that *sc.* is not bent sharply at right angles suggests that it might not belong to the family Trypaneidæ.

The genus is represented by the genotype, *C. pulchralis* End., which was originally described from Sumatra. Enderlein in his description of this species stated that it has six scutellar bristles. In this specimen there are only four strong bristles. On each side there are about fourteen very weak bristles, but they cannot be compared with the *sc.* bristles. Perhaps he considered that one of those weak bristles was the middle *sc.* bristle. It seems better to say that there are only four *sc.* bristles, ignoring the numerous weak bristles.

Genus ACANTHONEURA Macq., 1843, p. 220.

Syn. *Themara* Walk., 1857 *a*, p. 33.

This genus was erected by Macquart for *A. fuscipennis* from Bengal. Since then the type has not been redescribed, and Mons. Séguy of the Museum of Natural History, Paris, informed me that it is definitely lost. Bezzi (1913, p. 117) very briefly described a male and female from Assam, which he considered were identical with this species. He recorded them as such. Recently three specimens from Bengal were sent to me by Mr. Senior-White, and they appear to be the same as *A. fuscipennis* Bezz., and also agree with the original description of *A. fuscipennis* Macq., in all the characters mentioned in that description. The wing-pattern differs from Macquart's figure in certain details. In his figure, only R_1 and R_{4+5} are shown to be bristly; whereas in Bezzi's description, and in the above-mentioned specimens from Bengal M_{1+2}, M_{3+4}, and the posterior or *m* cross-vein are also bristly. The bristles on R_1 and R_{4+5} are longer and much more obvious than those on the other veins, and could easily have been overlooked. Moreover, it must be remembered that 100 years ago the chætotaxy of the head and thorax and the bristles on the wing-veins were not considered to have much generic value.

Walker (1857) erected the genus *Themara* for *ampla*, a species which agrees in every generic character with *A. fuscipennis* Bezzi, and with the three specimens mentioned above from Bengal. They all have the broad frons, thoracic chætotaxy complete, orbital bristles 2 : 2, R_{2+3} very wavy, R_1, R_{4+5}, M_{1+2}, M_{3+4}, and *m c-v* bristly. *A. fuscipennis* Bezz. and *T. ampla* Walk. are certainly congeneric.

Hendel (1928, p. 355) separated *Themara* from *Acanthoneura* on the presence of bristles on M_{3+4}. Evidently he did not consider *A. fuscipennis* Bezz. to be the same as *A. fuscipennis* Macq. It is possible that he was right, but there is no evidence to support such a view. Until far more collecting has been done in Bengal, it is not possible to decide whether Bezzi was right or not. The three specimens from Bengal, the type-locality of *fuscipennis* Macq., are certainly congeneric with *ampla* Walk., and they are the only recorded specimens from Bengal which resemble Macquart's figure, and agree with his description. To overcome the difficulty and confusion existing at the present time, three solutions are possible :—

(1) To follow Bezzi and sink *Themara*, confining the genus *Acanthoneura* to those species with R_1, R_{4+5}, M_{1+2}, M_{3+4} bristly, in addition to other characters. If this is done, it will be necessary to make a new genus for those species which have M_{1+2} and M_{3+4} bare. In view of the doubt, lack of accurate knowledge, and paucity of material from Bengal, it does not seem desirable to erect another genus and very possibly add to the confusion.

(2) To ignore the genus *Acanthoneura* because the original description is inadequate and the type no longer in existence, and to regard *Themara* Hend. (type *ampla*) a valid genus. It would then be necessary to erect a new genus for those species with M_{1+2} and M_{3+4} bare. For such a procedure, it would necessary to have the support and approval of the International Commission for Zoological Nomenclature; and the above-mentioned objections to the erection of a new genus still apply.

(3) To keep the limits of the genus *Acanthoneura* rather wide, and not to limit it as suggested by Hendel. *Themara* becomes a synonym, and there is no necessity to erect a new genus. This appears to be the most satisfactory solution. Most of the species show a remarkable resemblance to one another, and the total number of described species is not large enough to cause difficulties in identification. It is the solution adopted in this paper, and it is suggested that it be adopted by other workers until more accurate information is available.

The genus *Acanthoneura* is defined as follows: Occiput not swollen; frons variable; arista plumose with three rows of cilia, two dorsal and one ventral; orbitals usually 2 : 2; *pvt.* strong; ocellar bristle weak; thoracic chætotaxy complete; no propleural bristle; 2–3 *mpl.*; supra-alar bristles three; 3 pairs of scutellar bristles, of which the middle pair is usually weaker; 1 spur on middle tibiæ; front femora bristly; R_{2+3} wavy; *r-m cv.* distinctly after the middle of the median cell; at least C, R_1, and R_{4+5} bristly above.

So defined, *Acanthoneura* is easily distinguished from other genera of the Trypetinæ. It is represented by the following species :—

1. *Acanthoneura hirtipes* Rond.

This species is very close to *A. maculipennis* Westw. In the males the eye-stalks are usually longer and more slender, the facial dark band is always confined to the oral margin, and in width is always about one quarter of the median length of the face. The fore coxæ and prosternum vary from fulvous to light brown, but are never dark fuscous or black as in *maculipennis*. In the wings R_{2+3} curves more gradually towards the costa, and ends closer to the end of R_{4+5} than the end of R_1. The costa is not abnormally thickened between R_1 and R_{4+5} as in *maculipennis* and *ampla*. Unfortunately, the females are practically identical, the legs are uniformly fulvous to light brown in both species, the wing-markings and waviness of the veins are identical. The only difference between the females of the two species is the width of the facial band. In *hirtipes* it is confined to the outer, or lower, slope of the carinal furrow, whereas in *maculipennis* it extends almost to the base of the antennæ. In teneral and light-coloured specimens the facial band is only a little darker than the rest of the face, but is usually quite distinct if viewed from the side. *A. hirtipes* is only known from Borneo and Sumatra, and *A. maculipennis* from Java and Malaya.

It is possible that *hirtipes* is the same as *fuscipennis* Macq., but Bezzi (1913, p. 117) states that the head of the male of *A. fuscipennis* is very different from *Achias horsefieldi* Westw., which is a synonym of *A. maculipennis* and consequently has stalked eyes. It is inferred that in the male of *A. fuscipennis* Macq., according to Bezzi, the eyes are not stalked.

Enderlein (1911) confused *hirtipes* and *maculipennis*. His species *montina* (described from a single male), in which the legs are dark brown, R_{2+3} ending about half-way between the end of R_1 and R_{4+5} ; with a very broad head ; with a broad dark brown facial band ; and the thorax with three narrow longitudinal stripes, is evidently *A. maculipennis* Westw., and his *maculipennis* is *hirtipes* Rond.

Thanks to Dr. J. Smart of the British Museum, it is possible to fix *A. maculipennis*. A series of specimens from Malaya, Java, and Borneo were sent to him for comparison with the types of *maculipennis* Westw., *horsefieldi* Westw., and *ampla* Walk. He indicated which of the specimens were identical with the above types, and the synonymy recorded above is based on the material examined and checked by Dr. Smart. A more complete account of the synonymy of the above species will be recorded in another paper.

Rondani's original description was very brief and incomplete; consequently, having available a long series of specimens in excellent condition, the opportunity is taken to re-describe this rather confusing species.

Male.—Length of body 8 mm., of wing 9 mm.

Frons fulvous, shaded with dark brown or black; very broad, extended on the sides to form very striking and characteristic eye-stalks, which vary considerably in length, the proportion of length (measured from the median ocellus to lunule) to width varies from 11 : 249 to 8 : 68; ocellar triangle black; antennæ short, about two-thirds the shortest length of the face; dark fulvous; 1st and 2nd segments very short; 3rd segment about four times as long as 2nd; 2nd segment bristly; arista longer than face, plumose. Face pale fulvous with a narrow black band on the anterior extending on the genæ as far as the base of the eye-stalks; transverse carinal furrow rather broad, palps fulvous, covered with numerous short fine black bristles; genæ fulvous with a median transverse dark brown band; occiput fulvous.

Chætotaxy: *Vt.*2 (very wide apart); *pvt.* (strong); *oc.* (weak); *s.or.*2 : *i.or.*1; genal bristle; occipital row weak; all black.

Thorax.—Colour varying from fulvous to dark brown, with rather indistinct narrow black longitudinal lines, two median and a short post-sutural line on each side; most of the posterior portion of the mesonotum black; the humeral calli, propleuræ, prosternum, mesopleuræ, pteropleuræ, and most of the sternopleuræ lighter than the rest of the thorax; covered with short black hairs. Scutellum dark brown to black, sometimes lighter towards the apex.

Chætotaxy: Complete. *Scp.* strong; *mpl.*2; *dc.* distinctly behind the line joining the anterior *s.a.*; *ac.*3 pairs, the middle pair very weak.

Legs.—Vary from fulvous in lightest-coloured specimens to brown; tibiæ darker than other segments; front femora with two rows of 8–10 bristles; hind tibiæ with two long bristles on the outer side; middle tibiæ with a long spur and several shorter bristles.

Wings.—Pattern as shown in the photograph. The following veins distinctly wavy—R_{2+3}, last section of R_{4+5}, and last section of M_{1+2} (slightly), R_1, R_{4+5}, M_{1+2}, M_{4+5}, posterior cross-vein, and the basal section of Cu1 bristly above. R_1 (at the end), R_{2+3} (thickly), R_{4+5}, M_{1+2}, and posterior cross-vein bristled below. Stigma shorter than 2nd costal cell, the proportion (measured along C) being 2nd C to stigma 39 : 33. R_{2+3} ending on C closer to the end of R_{4+5} than R_1, the proportion (when measured directly and not along C) being end of R_1 to R_{2+3} : R_{2+3} to R_{4+5} : : 49 : 27.

The last curve of R_{2+3} gradual and not steep as in the male of *A. maculipennis*. The *r–m* cross-vein short and straight, the sections of M_{1+2} before and after it being in the proportion of 48 : 17. The extension of cell Cu short, its length in proportion Cu1+1A being 11 : 17.

Abdomen black with the first tergite, the anterior and posterior border of the 2nd, and the posterior border of the 5th (in the middle) fulvous. All the tergites covered with long black hairs, and a row of long black bristles along the posterior border of each tergite.

Female.—Frons broad, but constant in width, not extended to form eye-stalks, the proportion being length to width 10 : 20; slightly narrowed anteriorly. R_{2+3} the same as in the male ending well after halfway between the end of R_1 and R_{4+5}. Basal segment of ovipositor short, broad, flat; fulvous, with the apex black.

This species is represented by 23 males and 5 females from the foot of Mt. Dulit, junction of rivers Tinjar and Lejok, Aug. and Sept. 1932 (on bark of felled trees, old secondary forest).

2. *Acanthoneura hirsuta*, sp. n.

Male.—Length of body 6 mm., of wing 5 mm.

Head.—Frons varies from fulvous to pale brown, darker above the lunule, slightly longer than wide, the proportion being length (measured from median ocellus to lunule) to width 12 : 11; ocellar triangle black; vertical calli distinct, shining, reaching the middle of the frons, Face fulvous. Antennæ much shorter than face; fulvous; 1st and 2nd segments bristly; the proportion of the segments being 4 : 9 : 28, arista longer than face, plumose. Occiput and genæ fulvous. Palps bristly and fulvous in colour.

Chætotaxy.—*Vt.*2; *pvt.* strong and parallel; *oc.* weak; *s.or.*2, the upper weaker than *pvt.*; *i.or.*2, lower weak; genal bristle; occipital row strong; all black.

Thorax.—Dark fulvous to pale brown, with several dark brown or black stripes and markings; practically all the posterior part of the mesonotum black; two median black stripes; black patches in front of the suture, above the wings, on the mesopleuron, sternopleuron, pteropleuron, the lower half of the humeral calli, and post-scutellum. The propleuron, anterior part of the mesopleuron, and the prosternum light fulvous. Scutellum black with the apex fulvous.

Chætotaxy: Complete; *mpl.*2; *pt.* weak; *sc.*3 pairs, the middle pair very weak.

Legs.—Fulvous with hind tarsi dark brown. Remarkable for the several rows of numerous strong black bristles on the front femora; 2–3 long bristles on the hind tibiæ; middle tibiæ with a long spur.

Wings.—Pattern as in photograph. R_{2+3} (excessively), R_{4+5}, M_{1+2} wavy. C, R_1, R_{4+5}, M_{1+2}, M_{3+4}, and the base of Cu1 bristled above. Stigma and 2nd costal cell exactly the same length when measured along C. R_{2+3} with a shallow curve above the *r-m cv.*, and then above the posterior cross-vein it slopes steeply towards C, and then turns and runs into C gradually, much closer to the end of R_{4+5} than R_1, the proportions being end of R_1 to R_{2+3} : end of R_{2+3} to R_{4+5} : : 28 : 20. The sections of M_{1+2} before and after the *r-m cv.* in proportion of 26 : 13.

Abdomen.—Shining black with the first visible tergite, and the fore and hind margin of the 2nd fulvous; covered with long black hairs, and with a row of black bristles along the posterior margin of the tergites.

Described from two males from the foot of Mt. Dulit, junction of the rivers Tinjar and Lejok, Sept. and Oct. 1932 (on bark of felled trees). Types returned to the British Museum.

Acanthoneura hirsuta var. *nigrifacies*, nov.

There is one specimen which agrees in most characters with the above species, but differs in having the face uniformly black, the legs dark brown or black except for the under side of the front femora, and the tarsi which are fulvous. The thorax is mostly black, and there appears to be three longitudinal black lines instead of two. This is possibly a distinct species, but, until a longer series has been examined, it seems preferable to regard it as a variety. One male from the foot of Mt. Dulit, junction of Tinjar and Lejok rivers, 27. viii. 32. Type returned to British Museum.

Subfamily *TEPHRITINÆ*.

The only specimen of this subfamily included in the collection is the widely distributed *Platensina sumbana* originally described from Sumatra by Enderlein in 1911.

One female from River Kapah, tributary of the river Tinjar, 5. x. 32.

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EXPLANATION OF PLATE XV.

Fig. 1. ***Acanthoneura maculipennis*** **West.** Wing of male.

Fig. 2. ***Acanthoneura hirtipes*** **Rond.** Wing of male. Anal lobe slightly folded.

Fig. 3. ***Acanthoneura hirsuta*, sp. n.** Wing of male. Anal lobe slightly folded.

N.B.—Some of the veins have been retouched.

XLIX.—*Notes on the Classification of certain British Fishes.* By A. Fraser-Brunner.

The following notes represent an attempt to bring into line with modern systematic practice the generic arrangement of the British species of fishes belonging to the families dealt with. They may be taken partly as suggestions for the consideration of future workers and partly as a supplement to the British List *.

In view of the confusion that already exists in systematics as the result of isolated faunal work my remarks are confined to groups with which I am familiar and in which I have been able to compare British forms with relevant material from other parts of the world ; furthermore, all except two of the names used are already in existence. This paper does not purport so much to add new material as to point out what is already there.

Family **Squalidæ**.

The genera *Deania* Jordan & Snyder and *Lepidorhinus* Bonaparte are now usually regarded as distinct from *Centrophorus*, from which they differ in numerous small characters, such as the form of the nostrils and structure of the "scales." They are equally well distinguished from each other, and seem to me to have as much right to recognition as *Scymnodon*, which is already in use in the British List. If these genera are accepted the British species previously referred to *Centrophorus* should be known as *Deania calceus* (Lowe) and *Lepidorhinus squamosus* Gmelin.

The genotype of *Centrophorus* is *Squalus granulosus* Schneider ; of *Deania*, *D. eglantina* Jordan & Snyder ; of *Lepidorhinus*, *Squalus squamosus* Gmelin.

Family **Syngnathidæ**.

Syngnathus rostelatus Nilss. has recently been recorded from the Thames Estuary by Wells †, and should therefore be added to the list.

Family **Gadidæ**.

Judging from a perusal of recent work most modern ichthyologists are of the opinion that the genus *Gadus*, sensu lato, should be divided into groups of finer definition; there is, however, no general agreement as to the manner in which this should be accomplished. Generally speaking generic names have been applied to odd species, or groups of species, without critical comparison with others. Separations have been made on the presence or absence of a mental barbel, a character which, in my opinion, is primitively typical of Gadoids in general and may be lost independently in quite unrelated groups. Nevertheless the Gadinæ, comprised of those forms with three dorsal fins and two anals, is capable of subdivision into what I believe to be natural genera, some of which are further divisible into subgenera, and this arrangement, in so far as it concerns British species, may be shown as follows:—

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* 'List of British Vertebrates.' British Museum, 1935.

† Journ. An. Ecol., Cambridge, vii. no. 1, p. 122.

I. Upper jaw the longer; vomer toothed. Teeth in outer series of upper jaw stronger than others .... Genus *Gadus* Linn.
  A. Snout not longer than the eye. No interspace between anals. Barbel present . Subgenus *Trisopterus* [Raf.
  B. Snout much longer than eye.
    1. No interspace between anals. First anal much longer than second dorsal. Barbel absent.................... Subgenus *Merlangus* [Oken.
    2. Anals separated by an interspace. First anal equal to second dorsal. Barbel present .... Subgenus *Gadus* Linn.
II. Lower jaw the longer. Anals separated by an interspace.
  A. Vomer toothed.
    1. Teeth in outer series of upper jaw stronger than others.
      a. First anal fin about equal in length to the second dorsal. Barbel present .... Genus *Boreogadus* [Gthr.
      b. First anal fin very much longer than second dorsal, which is as short as the first and remote from the third. No barbel...................... Genus *Micromesistius* [Gill.
    2. Teeth in upper jaw of equal size. First anal longer than second dorsal. Barbel minute or absent .... Genus *Pollachius* Nilss.
  B. Vomer toothless. Jaws with a narrow band of small teeth. No barbel ...... Genus *Gadiculus* Guich.

The contents of these genera will be indicated by the following emendment of the British List:—

Gadus (*Trisopterus*) *minutus* L.
—— (——) *luscus* L.
—— (*Merlangus*) *merlangus* L.
—— (*Gadus*) *callarias* L.

Gadus (*Gadus*) *æglifinus* L.
Boreogadus esmarkii (Nilss.).
Micromesistius poutassou (Risso).
Pollachius pollachius (L.).
—— *virens* (L.).
Gadiculus argenteus Guich.

Other subgenera of *Gadus* are the American *Eleginus* and *Microgadus*. To *Boreogadus* belongs *B. saida*, the genotype. *Theragra* is a Pacific subgenus of *Pollachius*.

Gadus æglifinus is sometimes separated as the genus *Melanogrammus* Gill, on account of its higher supraoccipital and other crests and the enlargement of the hypocoracoid. The value of this is a matter of opinion.

Family **Ammodytidæ**.

A new species, *Ammodytes marinus*, has been described by Raitt *.

A. lanceolatus, with two tooth-like processes on the vomer, is the type of *Hyperoplus* Günther, which may be considered a subgenus of *Ammodytes*.

Family **Gobiidæ**.

Despite a great amount of work in recent years this group still requires much revision ; it is difficult to believe that *Gobius*, as now of necessity understood, is a natural genus.

It seems fairly certain that the fish described as an estuarine form of *Gobius minutus* by Holt and Byrne is in reality *G. microps* Kröyer, and should be included in the list under that name. It is the *G. parnelli* of Day.

Family **Scorpænidæ**.

The British species of this family have recently been admirably dealt with by Norman †.

Family **Triglidæ**.

The gurnards are usually divided into two groups, according to the size of the scales ; it is outside the province of this paper to discuss the advisability of this arrangement here, but I think it is more convenient than natural. All the British forms belong to the small-scaled group, and some of them are obviously generically distinct according to modern views.

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* 'Scottish Naturalist,' 1935, p. 61.

† Proc. Zool. Soc. London, 1935, pp. 611–614.

The arrangement suggested below is the result of a careful study of the British species in relation to the Old World forms in general :—

I. Lateral line without enlarged ossified scales. Pectoral fin reaching well beyond vent.
  A. Lateral line scales without spines ; the tubes conspicuous, unbranched. Preorbital more or less expanded as a translucent lamina supported by about six strong spinous projections. Suborbital keel well developed .... Genus *Trigla* Linn.
  B. Lateral line scales with several minute spines ; the tubes giving rise to long mucus canals extending transversely across side of fish, the canals giving off short lateral branches. Preorbital not expanded, without spines. No suborbital keel .... Genus *Trigloporus* [Smith.
II. Lateral line scales enlarged and ossified. Pectoral fin scarcely extending beyond vent.
  A. Lateral line scales not expanded transversely, each with a spinate median keel. Preorbitals not expanded, but with several small spinous projections. Suborbital keel, if present, represented by a row of feeble serrations. Second dorsal spine not longer than base of fin ..... Genus *Eutrigla*, nov.
  B. Lateral line scales expanded into transverse plates without spines. Preorbitals with several spinous projections—the anterior one more or less enlarged. Suborbital keel feeble. Second dorsal spine noticeably longer than the rest, longer than base of fin.................... Genus *Aspitrigla* [Fowler.

The genotype of *Trigla* is *T. lyra* Linn., and *T. lucerna* Linn. is clearly congeneric with it, differing only in degree of development of certain characters, such as preorbital expansion. The genotype of *Trigloporus* is *Trigla lineata* Gmelin 1788 (=*T. lastoviza* Brünnich, 1768) ; that of *Eutrigla* is *Trigla gurnardus* Linn., and that of *Aspitrigla* is *Trigla cuculus* Linn., the other British member being *Trigla obscura* Linn.

Chelidonichthys Kaup, frequently used in recent works, is a synonym of *Trigla* as understood here, having as its genotype *T. hirundo* (=*lucerna*) ; likewise the *Lyrichthys* of Kaup, based on *T. lyra*; his third genus, *Trigla*, is therefore automatically preoccupied.

Thus emended, the British List reads as follows :—

Trigla lyra L.
—— *lucerna* L.
Trigloporus lastoviza (Brünn.).
Eutrigla gurnardus (L.).
Aspitrigla cuculus (L.).
—— *obscura* (L.).

Trigla is represented outside Europe by *T. kumu*, which ranges from South Africa to Japan and New Zealand, *T. queckettí* of South Africa, which has some of the preorbital spines united, and one or two other nominal forms. *Pterygotrigla* Waite is a related genus with short fins.

Eutrigla gurnardus seems to be confined to Europe, and is the only member of the genus.

Trigloporus is represented in South Africa by *T. africanus*, which differs in having a scaly breast, fewer dorsal spines, and other minor features. The two British species of *Aspitrigla* seem to constitute the genus.

Most of the other Old World forms belong to *Lepidotrigla*.

Family **Cottidæ**.

Three genera which are now generally recognized and seem to be well defined are represented on the British coast. They are distinguished as follows :—

I. No deep pit before the eyes. No turbinal, supraorbital or nuchal spines. Preoperculum with a single spine. Sides naked..	Genus *Cottus* Linn.
II. A deep pit before the eyes. Turbinal, supraorbital, and nuchal spines present. Preoperculum with two or more spines.	
A. Sides naked. Supraorbital and nuchal spines slender and sharp	Genus *Acanthocottus* Girard.
B. Sides with rough tubercles above and below the lateral line; supraorbital and nuchal spines thick, blunt, rough projections........................	Genus *Oncocottus* Gill.

The British species are :—

Cottus gobio L. (genotype).
Acanthocottus scorpius (L.).
—— *bubalis* (Euphrasen).
Oncocottus quadricornis (L.) (genotype).

The genotype of *Acanthocottus* is *Cottus greenlandiscus* Cuv. & Val., from the west Atlantic, where there are two or three other species.

Family **Balistidæ.**

Balistes carolinensis Gmelin has page priority over *B. capriscus* Gmelin.

The doubtfully recorded *Balistes maculatus* Gmelin belongs to *Canthidermis* Swainson, a well-defined genus, differing from *Balistes* in many ways, notably the absence of enlarged plates behind the gill-opening.

Family **Gobiisocidæ.**

No great attention has been paid to the British members of this family from the systematic point of view, otherwise they would not have appeared as a single genus in every work on British fishes, as is actually the case. Where attempts have been made to separate them, however, too much importance has been paid to the extent of the dorsal and anal fins, and other important characters have been overlooked; for instance, the number of caudal rays differ enormously, and as this number hardly ever varies within a genus and is often constant in a whole order this character is worthy of attention. In the present instance it is almost certain that the caudal fin with the greater number of rays is composite, having in it part of the dorsal and anal fins, but this does not reduce its significance in marking off those forms having that peculiarity. The form of the mouth in *Diplecogaster* has also been overlooked.

The British genera can be distinguished as follows:—

I. Premaxillary teeth exposed when mouth is closed. Dorsal and anal fins short, about equal in extent. Caudal rays 12. Nostrils on short papillæ. Head without lateral ridges .... Genus *Diplecogaster*, [nov.

II. Premaxillary teeth hidden when mouth is closed. Base of dorsal fin longer than that of anal (rays nearly twice as many). Caudal rays 18–19.

  A. Nostrils on short papillæ. Head without distinct lateral ridges. Dorsal and anal fins distinct from caudal .... Genus *Mirbelia* [Canestrini.

  B. Anterior nostril with a bifid tentacle. Head with distinct fold or ridge on each side. Dorsal and anal fins united with caudal............................ Genus *Lepadogaster* [Gouan.

The new genus *Diplecogaster* is proposed to include three well-marked species—*Cyclopterus bimaculatus* Bonnaterre, 1788, which is selected as the genotype, *Lepadogaster microcephalus* Brook, and *L. pellegrini* Chabanaud. A key to these three species has been given by Chabanaud 1925.

The British species may now be listed thus :—

Diplecogaster bimaculatus (Bonnaterre).
—— *microcephalus* (Brook).
Mirbelia decandollii (Risso).
Lepadogaster lepadogaster (Bonnaterre).

In passing it may not be out of place to mention here the genus *Gouania* Nardo, based on *Lepadogaster wildenowii* Risso, with several synonyms such as *Rupisuga*, *Apepton*, etc. ; it resembles *Lepadogaster* in having the vertical fins united, but differs in lacking the nasal tentacles and in other small characters. It is possible that it might prove subgeneric.

L.—*New or little-known* Tipulidæ (*Diptera*).—LV. *Neotropical Species*.

By Charles P. Alexander, Ph.D., F.R.E.S., Massachusetts State College, Amherst, Massachusetts, U.S.A.

I am here discussing a series of Limoniine crane-flies that were taken in eastern Ecuador by Mr. William Clarke-Macintyre and his native collectors. Most of the species were secured at and near Abitagua, on the Rio Pastaza, at an approximate altitude of 1200 metres. My sincere thanks are extended to Mr. Macintyre for his continued efforts in making known the rich Tipulid fauna of the region. All types are preserved in my private collection of these flies.

Limonia (*Limonia*) *pastazicola*, sp. n.

Belongs to the *eiseni* group ; mesonotum reddish brown, darker behind ; legs black ; wings with a brownish tinge, restrictedly patterned with darker brown, including areas at origin of *Rs*, fork of *Sc*, stigma, cord and outer end of cell 1st M_2 ; *Rs* angulated and spurred at origin ;

abdominal tergites black, the sternites more bicoloured; male hypopygium with the two spines of the rostral prolongation of the ventral dististyle widely separated, each acutely pointed; at base of prolongation a strong tubercle provided with two modified setæ, one from apex, the other from base; gonapophyses with mesal-apical lobe a slender blackened spine; ædeagus relatively narrow, parallel-sided.

Male.—Length about 8 mm.; wing 9 mm.

Rostrum and palpi black. Antennæ black throughout; flagellar segments long-oval, with long, unilaterally distributed verticils. Head black; anterior vertex narrow.

Pronotum brownish yellow. Mesonotal præscutum reddish brown, restrictedly darkened medially; posterior sclerites of notum more uniformly darkened. Pleura chiefly dark brown, the dorsal half more intensely so but not forming a well-defined longitudinal stripe. Halteres dark brown, the base of stem restrictedly pale. Legs with the coxæ and trochanters yellowish testaceous; remainder of legs black, the femoral bases restrictedly brightened. Wings with a brown tinge, restrictedly patterned with darker brown, as follows:—Stigma; origin of *Rs*; fork of *Sc*; cord and outer end of cell 1st M_2; veins brown, a little darker in the clouded areas. Venation: *Sc* relatively long, Sc_1 ending about opposite two-thirds to three-fourths *Rs*, Sc_2 close to its tip; *Rs* angulated and spurred at origin; *m–cu* oblique, at the fork of *M*.

Abdominal tergites black, the sternites more bicoloured, brownish black, the basal portion of the more proximal segments obscure yellow; hypopygium black, the ventral dististyles pale yellow. Male hypopygium with the dorsal dististyle long, the tip strongly decurved. Ventral dististyle relatively small, the rostral prolongation conspicuous, very high basally; two pale acute spines that are widely separated, the distance between their bases nearly equal to the length of the spine; at base of prolongation a strong tubercle with two modified setæ, one from apex, the other from base of tubercle. Gonapophyses with mesal-apical lobe a slender blackened spine. Ædeagus relatively narrow, parallel-sided, the apical lobes not divergent.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, Rio Pastaza, altitude 1200 metres, March 23, 1937 (*Macintyre*).

Limonia (*Limonia*) *pastazicola* is quite distinct from the other species of the group, the chief distinctions being found in the structure of the male hypopygium.

Limonia (*Limonia*) *hyperphallus*, sp. n.

Belongs to the *eiseni* group; front silvery; mesonotal præscutum polished black, the posterior sclerites darker; pleura with a broad dorsal black stripe; legs black; wings with a brown tinge, the costal and apical portions more suffused; a restricted but conspicuous dark brown pattern; *Sc* long, *Rs* angulated and spurred at origin; abdominal tergites uniformly brownish black; sternites bicoloured; male hypopygium with the rostral prolongation relatively slender, the pale rostral spines placed close together; a single modified seta at base of prolongation; mesal-apical lobes of gonapophyses broad, each outer angle produced; ædeagus unusually broad, the apical lobes very widely flaring.

Male.—Length about 6·5 mm.; wing 7 mm.

Female.—Length about 8 mm.; wing 7·5 mm.

Rostrum and palpi black. Antennæ black throughout; flagellar segments oval, the long verticils unilaterally arranged. Front silvery, posterior portion of head dark brown; anterior vertex reduced to a narrow strip.

Pronotum brownish yellow above, darker on sides. Mesonotal præscutum chiefly polished brown, the humeral region obscure yellow; posterior sclerites of notum brownish black, the mediotergite a little more brightened. Pleura brown, with a broad dorsal black stripe, extending from the sides of the pronotum to the abdomen, passing through the base of halteres. Halteres dusky. Legs with the coxæ and trochanters obscure yellow; femora dark brown, tibiæ and tarsi black. Wings with a brown tinge, the costal portion and wing-tip in outer radial field more suffused; a conspicuous but restricted darker brown pattern, as follows:—Origin *Rs*; fork of *Sc*; stigma; cord and outer end of cell 1st M_2; veins brown. Venation: *Sc* long, Sc_1 ending about opposite three-fourths the length of *Rs*, Sc_2 near its tip; *Rs* square and short-spurred at origin; *m-cu* close to fork of *M*, exceeding the distal section of Cu_1.

Abdominal tergites uniformly brownish black; sternites bicoloured, the bases yellow, the apices broadly blackened, the amount of the latter increasing on the outer segments; hypopygium black, the ventral dististyle pale. Male hypopygium with the ventral dististyle of moderate size, the rostral prolongation relatively slender; rostral spines pale, placed close together, their punctures less than their own width apart, located at base of prolongation; a single modified seta near base of prolongation, this not arising from a basal tubercle. Gonapophyses with mesal-apical lobe blackened, very broad, the apex subtruncated, with each angle slightly produced into a spinous point. Ædeagus unusually broad, especially the widely flaring apex, which is about one-half as wide as the transverse diameter of the tergite.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, Rio Pastaza, altitude 1200 metres, April 7, 1937 (*Macintyre*). *Allotopotype*, ♀, April 5, 1937.

The nearest relative is *Limonia* (*Limonia*) *caribæa* Alexander (Cuba), which differs especially in the structure of the male hypopygium, as the ventral dististyle and the unusually broad ædeagus.

Limonia (*Limonia*) *bimucronata*, sp. n.

Belongs to the *eiseni* group; head black, the vertex with a narrow median grey line; thorax obscure brownish yellow, including the pleura; knobs of halteres dark brown; legs black; wings yellow, beyond the cord with all outer radial cells deeper fulvous brown; a sparse brown pattern, including cord and outer end of cell 1st M_2; *Rs* square and spurred at origin; abdominal tergites bicoloured, yellow, the apices brown; male hypopygium with the ventro-mesal lobe of basistyle bearing a lateral tubercle; spines of rostral prolongation of ventral dististyle widely separated; gonapophyses bispinous at tips.

Male.—Length about 6·5 mm.; wing 7·2 mm.

Rostrum and palpi black. Antennæ black throughout; flagellar segments oval, passing into long-oval, the more basal segments with very short, glabrous, apical pedicels; terminal segment one-half longer than the penultimate; verticils very long, unilaterally distributed. Head black, the front, anterior vertex, and a narrow median line on posterior vertex light grey.

Thorax almost uniformly obscure brownish yellow, the surface subnitidous, the posterior sclerites of the mesonotum a trifle darker. Halteres with stem yellow, knob dark brown. Legs with the coxæ and trochanters yellow; femora brownish black, the bases very vaguely paler; tibiæ and tarsi black; claws with a single very long tooth. Wings with the ground-colour yellow, including all cells basad of cord, beyond cord reaching the wing-tip in cells R_5, 1*st* M_2, 2*nd* M_2, and M_3; beyond cord the ground-colour of remaining cells is more fulvous brown, more saturated in the outer radial field; a sparse dark brown pattern, as follows:—Origin of *Rs*, fork of *Sc*, cord, outer end of cell 1*st* M_2, and a small marginal spot on R_3; veins yellow, darker in the infuscated portions. Venation: *Sc* moderately long, Sc_1 ending shortly beyond mid-length of *Rs*, Sc_2 at its tip; *Rs* square and spurred at origin; free tip of Sc_2 placed shortly distad of level of R_2; cell 1*st* M_2 about equal in length to vein M_{1+2} beyond it; *m–cu* shortly before fork of *M*.

Abdominal tergites bicoloured, the bases of segments yellow, the apices brown, on the more basal segments including about one-half the segment, the brown becoming more restricted on outer segments; sternites and hypopygium more uniformly yellow. Male hypopygium with the ventro-mesal lobe of basistyle bearing a conspicuous lateral lobule. Dorsal dististyle nearly straight, the long tip curved at a right angle. Ventral dististyle relatively small, the rostral portion very large and compressed, as in the group; rostral spines blunt, pale, separated on prolongation by a distance subequal to their own length, their bases surrounded by abundant silken setulæ; modified setæ from base of style arising from a low inconspicuous tubercle. Gonapophyses black, the mesal-apical lobe relatively narrow, terminating in two unequal spines. Ædeagus of moderate width.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, Rio Pastaza, altitude 1200 metres, August 20, 1937 (*Macintyre*).

Limonia (*Limonia*) *bimucronata* is quite distinct from the other described species of the group having bispinous gonapophyses, as *L.* (*L.*) *caribæa* Alexander and *L.* (*L.*) *hyperphallus*, sp. n.

Limonia (*Limonia*) *lustralis*, sp. n

Belongs to the *insularis* group; general coloration of thorax obscure yellow, the notum unpatterned; antennæ and legs black throughout; wings bright brownish yellow, the outer radial field more saturated; a restricted dark brown pattern; *Rs* long, square at origin; cell 1*st* M_2 subequal in length to vein M_{1+2} beyond it; *m–cu* at fork of *M*; abdominal tergites dark brown, sternites obscure yellow.

Female.—Length about 8 mm.; wing 8 mm.

Rostrum and palpi black. Antennæ black throughout; basal flagellar segments short-oval to pyriform, with very short apical pedicels; outer segments more elongate, the terminal segment very long, nearly twice the penultimate. Front grey, the posterior parts of head black; anterior vertex narrow, about one-half the diameter of scape.

Pronotum dark brown medially, paling to yellow on sides. Mesonotum and pleura almost uniform obscure yellow, the ventral sternopleurite slightly darkened. Halteres short, weakly infuscated. Legs with the coxæ and trochanters yellow; remainder of legs intensely black. Wings bright brownish yellow, the costal region and outer radial field more saturated; a very restricted dark brown pattern, as follows:—Origin of *Rs*; fork of *Sc*; narrow seams on free tip of Sc_2 and R_2; cord and outer end of cell 1*st* M_2 very narrowly bordered with brown; small marginal clouds at ends of all longitudinal veins, largest on R_{4+5}; stigma oval, pale brown, scarcely darker than the ground; veins yellow, darker in the infuscated areas. Venation: *Rs* long, square at origin, longer than vein *R* alone; *Sc* long, Sc_1 ending about opposite five-sixths the length of *Rs*, Sc_2 at tip; R_{2+3} relatively short, less than twice the basal section of R_{4+5}; cell 1*st* M_2 subequal in length to vein M_{1+2} beyond it; *m–cu* at fork of *M*.

Abdominal tergites dark brown, sternites obscure yellow; genital segment yellow; cerci slender, upcurved.

Hab. Ecuador (Oriente).

Holotype, ♀, Abitagua, Rio Pastaza, altitude 1200 metres, November 21, 1937 (*Macintyre*).

The nearest relatives of the present fly seem to be *Limonia* (*Limonia*) *capnora* Alexander, *L.* (*L.*) *lutzi* Alexander, and *L.* (*L.*) *infucata* Alexander, all of which differ in the coloration of the thorax, legs, and wings.

Limonia (*Limonia*) *grossa*, sp. n.

Belongs to the *insularis* group; size large (wing, male, 11 mm.); general coloration brown; legs uniformly yellowish brown; wings tinged with brown, patterned with still darker brown; Sc_1 ending about opposite four-fifths the length of *Rs*, the latter nearly square at origin; R_2 greatly reduced; abdomen weakly bicoloured; male hypopygium with the rostral prolongation more constricted at base than at apex.

Male.—Length about 9 mm.; wing 11 mm.

Rostrum and palpi black. Antennæ black; flagellar segments cylindrical, with short, glabrous, apical pedicels; terminal segment elongate. Head brownish black, the front more silvery; anterior vertex narrow, about one-half the diameter of the scape.

Thorax almost uniform brown, the posterior pleurites somewhat darker; præscutum without stripes; setæ of interspaces sparse. Halteres with stem dusky, knob more infuscated. Legs with coxæ and trochanters brown; remainder of legs uniform yellowish brown. Wings with a brownish tinge, patterned with still darker brown, including restricted seams at origin of *Rs*, fork of *Sc*, R_2 and free tip of Sc_2, cord, and outer end of cell *1st* M_2; veins pale brownish yellow, darker in the clouded portions. Wing-tip obtuse. Venation: Sc_1 ending about opposite four-fifths the length of *Rs*, Sc_2 at its tip; *Rs* nearly square at origin; R_1 bent strongly caudad on outer portion, greatly reducing vein R_2, Sc_2 correspondingly lengthened; basal section of R_{4+5} short, angulated at near mid-length; *m–cu* just before the fork of *M*.

Abdomen weakly bicoloured, obscure yellow, the caudal margins of the individual segments broadly infuscated; hypopygium dark brown. Male hypopygium with the rostral prolongation of the ventral dististyle constricted at base, thence gently expanded into a head. Dorsal dististyle scabrous, as in the group.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, Rio Pastaza, altitude 1200 metres, April 21, 1937 (*Macintyre*).

Limonia (*Limonia*) *grossa* is most closely allied to *L.* (*L.*) *fumosa* (Alexander), differing in the large size and in the structure of the male hypopygium. There are now numerous Neotropical species referable to this group, several of which have the legs variegated in various patterns.

Limonia (*Neolimnobia*) *corallina*, sp. n.

General coloration coral-red; antennal scape and pedicel black, flagellar segments bicoloured, yellow and dark brown; head black; femora brownish yellow, the tips abruptly clearer yellow; wings with the ground-colour pale yellow, with a pale brown reticulated pattern.

Male.—Length about 7 mm.; wing 8 mm.

Rostrum and palpi black. Antennæ with the scape and pedicel black; flagellar segments bicoloured, yellow, with a dark brown subbasal ring, terminal segments uniformly dark; flagellar segments oval to long-oval, the incisures well indicated; verticils much exceeding the segments. Head black, the orbits very narrowly grey; anterior vertex a little less than twice as wide as the diameter of the scape.

Thorax uniformly coral-red, without markings. Halteres yellow throughout. Legs with the coxæ and trochanters reddish yellow; femora brownish yellow to pale brown, the tip narrowly and abruptly yellow; tibiæ and tarsi brownish yellow, the terminal tarsal segments darkened; claws conspicuously toothed. Wings with the ground-colour pale yellow, conspicuously marked with a pale brown reticulate pattern; veins pale yellow, a little darkened in the clouded areas. Venation: Sc_1 ending just before origin of *Rs*, Sc_2 at its extreme tip; *Rs* arcuated, about twice as long as the more strongly arcuated basal section of R_{4+5}; supernumerary cross-vein in cell R_3 at near two-thirds the length of the cell; cell 1st M_2 nearly as long as vein M_{1+2} beyond it; *m–cu* shortly beyond the fork of *M*.

Abdomen, including hypopygium, reddish yellow, the caudal margins of the segments vaguely darker; hypopygium, especially the large ventral dististyles, brown.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, Rio Pastaza, altitude 1200 metres, April 7, 1937 (*Macintyre*).

Limonia (*Neolimnobia*) *corallina* is very different from the other species of the subgenus so far described. The specific name has a double significance, referring to the body-coloration and to the wing-pattern.

Limonia (*Peripheroptera*) *prindlei*, sp. n.

Size very large (wing 10 mm. or over); coloration of body polished black; antennæ, halteres, and legs black; wings deep yellow, restrictedly patterned with black, including the costal border; wing-tip more or less infumed.

Male.—Length about 7–8 mm.; wing 11–15 mm.

Female.—Length about 8 mm.; wing 10–10·5 mm.

Rostrum and palpi black. Antennæ black throughout; flagellar segments oval. Head polished black; anterior vertex broad, in male nearly four times the diameter of scape.

Thorax entirely polished black. Halteres and legs black throughout. Wings deep yellow, restrictedly patterned with black, including the narrow costal border to beyond wing apex, the latter more extensively infumed in certain specimens; cord very narrowly seamed with brown, not evident in the paratype female; veins clear yellow, brown in the darkened areas. Venation: free tip of Sc_2 some distance basad of level of R_2; Sc_2 at near mid-length of vein *Sc*; *m–cu* at or shortly beyond fork of *M*; cell *2nd A* relatively long and narrow.

Abdomen, including the male hypopygium, polished black; in female the extreme caudal borders of segments pale.

Hab. Ecuador (Oriente).

Holotype, ♂, Pundoa, altitude 2600 metres, August 21, 1937 (*Macintyre*). *Allotopotype*, ♀, August 20, 1937. *Paratopotypes*, 2 ♂♂, 1 broken ♀, with holotype.

This striking species is named in honour of my brother, Professor William Prindle Alexander, Hayes Professor of Natural History, Buffalo Museum of Science. It is entirely different from all other members of the subgenus so far described. By my key to the species of *Peripheroptera* (Ent. News, xxiv. p. 409, 1913) the fly runs to *L.* (*P.*) *teucholaboides* (Alexander), of Peru, an entirely different species.

Limonia (*Geranomyia*) *luteimana*, sp. n.

General coloration black, including the notum and dorsal half of pleura; rostrum long; halteres black; femora and tibiæ obscure yellow, the tips darkened; basitarsi brownish black, the outer tarsal segments yellow; wings blackened, the costal border broadly whitish; Sc_1 ending opposite origin of *Rs*; abdominal tergites black.

Female.—Length, excluding rostrum, about 8 mm.; wing 7 mm.; rostrum about 6 mm.

Rostrum unusually long, black throughout. Antennæ black; flagellar segments cylindrical, with unilaterally arranged verticils that slightly exceed the segments in length. Head brownish black.

Pronotum dark brown medially, obscure yellow on sides. Mesonotal præscutum almost covered by three confluent, polished black stripes, the yellow ground-colour restricted to small humeral triangles; posterior sclerites of notum polished black. Pleura with dorsal half polished black, concolorous with the notum, the ventral half abruptly yellow. Halteres black. Legs with the coxæ and trochanters pale yellow; femora obscure yellow, the tips rather narrowly dark brown; tibiæ yellowish brown, the tips very narrowly and inconspicuously darkened; basitarsi brownish black, the succeeding tarsal segments pale yellow. Wings with the ground-colour strongly blackened, the prearcular field and costal border broadly and abruptly whitened, interrupted by narrow dark extensions at *h*, mid-length of vein *Sc*, origin of *Rs*, and at stigma, the white areas not quite reaching vein *M* behind; stigma a trifle darker than the ground; veins dark brown, paler in the whitened costal portions. Venation: *Sc* short, Sc_1 ending opposite origin of *Rs*, Sc_2 at its tip; basal section of R_{4+5} long, shortening *r–m*; cell 1st M_2 subequal to vein M_{1+2} beyond it; *m–cu* at fork of *M*.

Abdominal tergites black, sternites obscure yellow, the borders restrictedly darkened. Ovipositor with shield black, valves horn-yellow, straight and slender.

Hab. Ecuador (Oriente).

Holotype, ♀, Abitagua, Rio Pastaza, altitude 1200 metres, September 21, 1937 (*Macintyre*).

Limonia (*Geranomyia*) *luteimana* is closest to *L.* (*G.*) *lacteitarsis* (Alexander), of Colombia, which differs in the shorter rostrum, pale antennal scape and pedicel, and in the details of wing-pattern and venation.

Limonia (*Geranomyia*) *tumidibasis*, sp. n.

General coloration greenish yellow; rostrum relatively short; antennæ black throughout, scape elongate; præscutum with a single dark stripe; femora brownish yellow, the tips yellow, preceded by a narrow dark brown ring; wings yellow, heavily patterned with brown, the third costal area involving the origin of *Rs* and the fork of *Sc*; male hypopygium with the rostral spines elongate, from unusually long basal tubercles, placed close together, the outer spine close to apex of prolongation; mesal-apical lobe of gonapophysis long, slender, curved.

Male.—Length, excluding rostrum, about 6 mm.; wing 7 mm.; rostrum about 2·3 mm.

Rostrum relatively short, about twice the length of antennæ, black throughout; palpi black. Antennæ black throughout, scape unusally long, nearly as long as the basal four flagellar segments together; flagellar segments oval to subcylindrical; verticils of moderate length. Head grey, darkened behind; anterior vertex reduced to a narrow line.

Pronotum greenish yellow. Mesonotal præscutum greenish yellow, with a single brown median stripe; scutal lobes darkened; scutellum and postnotum testaceous yellow. Pleura testaceous yellow. Halteres broken. Legs with the coxæ and trochanters pale; femora brownish yellow, the tips yellow, preceded by a slightly narrower, dark brown ring; tibiæ pale brown, the tips narrowly dark brown; tarsi brown, the outer segments passing into black. Wings yellow, the costal portion a little more suffused; a brown pattern, distributed as follows:—Five costal areas, the first arcular, the third a major common area involving the origin of *Rs* and fork of *Sc*; fourth area stigmal; fifth small, at end of vein R_3; cord and outer end of cell *1st* M_2 seamed with brown; brown marginal clouds at ends of veins Cu_1, *1st* *A*, and *2nd* *A*, the second largest; veins yellow, darker in the clouded areas. Venation: *Sc* relatively short, Sc_1 ending about opposite one-fifth the length of *Rs*, Sc_2 a short distance from its tip; R_{2+3} less than twice the basal section of R_{4+5}; *r–m* relatively short, obliterative; cell *1st* M_2 longer than vein M_{1+2} beyond it; *m–cu* shortly before fork of *M*.

Abdominal tergites weakly bicolored, the segments yellow, with the caudal portions a little darker; hypopygium yellow. Male hypopygium with the caudal margin of the tergite weakly emarginate, the lobes broadly rounded, with numerous setæ. Dorsal dististyle relatively small, gently curved. Ventral dististyle large and fleshy, the prolongation short but conspicuous; two rostral spines placed close together on long conspicuous tubercles, the outer far distad, the apex of prolongation beyond it sloping off precipitously; outer spine about three times its long tubercle, the spine itself straight, exceeding the dorsal dististyle in length; inner spine from a slightly shorter tubercle, gently curved, about two-thirds the length of outer spine. Gonapophyses with mesal-apical lobe unusually long and slender, curved, the tips subacute, weakly darkened.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, Rio Pastaza, altitude 1200 metres, April 4, 1937 (*Macintyre*).

Limonia (*Geranomyia*) *tumidibasis* is allied to species such as *L.* (*G.*) *eurygramma* Alexander and *L.* (*G.*) *glauca* (Alexander), differing conspicuously in the structure of the male hypopygium, notably the ventral dististyle.

Limonia (*Rhipidia*) *jubilata*, sp. n.

General coloration black, the præscutum and scutum variegated with chestnut-brown; antennæ (male) with ten bipectinate segments, the flagellum bicoloured; halteres pale yellow; femora yellow, with a narrow, brownish black, subterminal ring; tarsi passing into brown; wings handsomely variegated with pale brown washes and darker brown spots on a yellow ground;

m–cu at fork of *M*; abdominal segments conspicuously bicoloured, obscure yellow, the caudal margins narrowly black; male hypopygium with three rostral spines, these arising at near mid-length of the rostral prolongation.

Male.—Length about 6 mm.; wing 6·4–6·5 mm.; antenna about 2 mm.

Rostrum and palpi black. Antennæ bicoloured; scape black, pedicel brown; flagellar segments with base and branches black, the apical pedicels conspicuously white; first flagellar segment produced into a simple point that is a little shorter than the segment; flagellar segments 2 to 11, inclusive, rather long-bipectinate, the longest branches (at near mid-length of organ) about three times the segment; terminal segment simple, longer than the penultimate segment or its branches. Head dark grey, variegated with brown on occiput; anterior vertex reduced to a narrow strip that is about one-third the diameter of scape.

Pronotum dark brown. Mesonotal præscutum with median portion on cephalic half brownish black, the posterior half expanded, more chestnut-brown; the humeral region obscure yellow, the sublateral portions broadly grey, the lateral margins broadly infuscated; scutum black, the centres of lobes chestnut-brown; scutellum brownish black; mediotergite black, pleurotergite pruinose. Pleura with two narrow black longitudinal stripes, the dorsopleural region and dorsal sternopleurite paler brownish grey. Halteres pale yellow. Legs with the coxæ blackened; trochanters obscure yellow; femora yellow, with a narrow, brownish black ring before the subequal yellow apex; tibiæ and basal segments of tarsi yellow, the outer segments passing into brown. Wings with the ground-colour light yellow, variegated by pale brown washes and conspicuous darker brown spots; the dark areas include the following:—Arculus; mid-distance between arculus and origin of *Rs* in cell *Sc*; origin of *Rs*; fork of *Sc*; cord and outer end of cell 1*st* M_2; the more conspicuous paler brown washes include the basal third of wing, outer radial field, and outer portions of cells *Cu* and 1*st A*, variegated by yellowish grey areas before arculus, before origin of *Rs*, before and beyond stigma; on both sides of cord in radial and medial fields, and in outer end of cell *1st A* adjoining vein *2nd A*; stigma with yellow centre, the margin brown; veins brown, brighter in the ground areas. Venation: *Sc* ending opposite or just beyond mid-length of *Rs*, Sc_2 at tip; *m–cu* at fork of *M*.

Abdominal segments conspicuously bicoloured, obscure yellow, the caudal margins narrowly but very conspicuously blackened; hypopygium brownish yellow. Male hypopygium with the ventro-mesal lobe of basistyle simple. Dorsal dististyle curved, the long tip acute. Ventral dististyle fleshy, the rostral prolongation moderately long, with three rostral spines arising close together at near mid length of prolongation on outer margin; prolongation beyond insertion of spines shorter than the shortest of latter. Gonapophyses with mesal-apical lobe long and slender, blackened

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, Rio Pastaza, altitude 1200 metres, April 21, 1937 (*Macintyre*). *Paratopotype*, ♂, April 3, 1937.

The present fly is entirely different from the numerous Neotropical species of the subgenus so far made known.

Orimarga (Orimarga) multipunctata, sp. n.

General coloration of mesonotum greyish yellow, the præscutum with four brown lines; halteres pale yellow; femora brown, the tips more darkened; tibiæ infuscated, the base narrowly white, the apex narrowly darkened; tarsi white; wings pale yellow, heavily spotted with brown; R_{1+2} entire, very long, subequal to *Rs*; *m–cu* about its own length before the fork of *M*; abdominal tergites weakly bicoloured.

Male.—Length about 7 mm.; wing 6·5 mm.

Female.—Length about 7·5 mm.; wing 6·7 mm.

Rostrum pale, palpi black. Antennæ black; flagellar segments oval. Front light grey; vertex darker grey.

Mesonotal præscutum greyish yellow, with four brown lines, the intermediate pair narrower, incomplete in front and behind; posterior sclerites of notum pale brownish yellow. Pleura brownish yellow, with a conspicuous dorsal black stripe; ventral sternopleurite less conspicuously infuscated. Halteres pale yellow. Legs with the fore coxæ darkened, remaining coxæ obscure yellow; trochanters yellow; femora brown, the tips slightly more darkened; tibiæ infuscated, the base narrowly white, the apex narrowly blackened; tarsi white, the terminal segment darkened. Wings pale yellow, the costal portion somewhat deeper yellow; a conspicuous brown spotted pattern, as follows:—Arculus; origin of *Rs*; fork of *Sc*; R_2; anterior cord and *m–cu*; fork of M_{3+4}; large marginal areas on veins R_{1+2} and *2nd A*; smaller clouds on M_3, M_4, Cu_1, and *1st A*; a weaker brown wash in base of cell *Cu*; veins yellow, brown in the clouded areas. Venation: Sc_1 ending about opposite five-sixths the length of *Rs*, Sc_2 a short distance from its tip; *Rs* weakly angulated at origin; free tip of Sc_2 about its own length before R_2; R_{1+2} entire, very long, subequal in length to *Rs*; cell M_3 subequal to its petiole; *m–cu* about its own length before the fork of *M*; cell *2nd A* relatively wide.

Abdominal tergites weakly bicoloured, the basal rings obscure brownish yellow, the apices brown; subterminal segments more uniformly darkened; sternites more uniformly pale yellow.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, Rio Pastaza, altitude 1200 metres, September 20, 1937 (***Macintyre***). *Allotopotype*, ♀.

Readily distinguished from other species with very long, entire vein R_{1+2}, as *Orimarga* (*Orimarga*) *excessiva* Alexander and *O.* (*O.*) *pallidibasis* Alexander, by the heavily spotted wings.

Orimarga (*Orimarga*) *parvipuncta*, sp. n.

General coloration of mesonotum brownish grey, posterior sclerites darker; pleura with a broad black dorsal stripe; antennal flagellum yellow; halteres pale; femora brown, passing into brownish black at tips; tibiæ white, in cases more or less infuscated beyond the base, the tips conspicuously blackened; tarsi white, the outer portions of the basitarsi weakly infumed; wings greyish yellow, the prearcular field milky white; a restricted brown-spotted pattern on certain veins; *Rs* relatively short, R_{1+2} very long; cell M_3 subequal to its petiole; abdominal segments weakly bicoloured, black, the caudal margins obscure yellow ; hypopygium black.

Male.—Length about 7–7·5 mm. ; wing 6·5 mm.

Female.—Length about 8 mm. ; wing 6 mm.

Rostrum and palpi black. Antennæ with the scape black, remainder of organ pale yellow. Head grey.

Mesonotal præscutum uniformly brownish grey, the lateral margin narrowly paler ; posterior sclerites darker, pruinose ; mediotergite dark. Pleura with a broad black dorsal stripe, the sternopleurite pale brown. Halteres pale. Legs with the coxæ and trochanters testaceous yellow ; femora, including the front pair, brown, passing into brownish black at tips ; tibiæ white, in cases more or less infuscated beyond the base, especially on fore pair, the tips conspicuously black, the amount subequal on all legs ; tarsi white, the distal portion of basitarsi weakly infuscated, forming a more or less evident ring at mid-length of tarsi. Wings tinged with greyish yellow, the præarcular field milky white ; a restricted brown pattern, as follows :—Origin of *Rs* ; fork of *Sc* ; R_2 ; cord ; tips of outer radial veins ; veins yellow, whitened in prearcular field, infuscated in the clouded areas. Venation : *Rs* relatively short, subequal to or a little longer than R_{2+3}, usually shorter than the very long R_{1+2} ; cell M_3 subequal to its petiole ; *m-cu* close to fork of *M*.

Abdominal segments weakly bicoloured, black, the caudal margins obscure yellow to brownish yellow ; hypopygium black.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, Rio Pastaza, altitude 1200 metres, September 20, 1937 (*Macintyre*). *Allotopotype*, ♀, September 22, 1937. *Paratopotypes*, 2 ♂♂, September 21, 1937.

The nearest ally is *Orimarga* (*Orimarga*) *pallidibasis* Alexander (Amazonian Peru), which differs in the pattern of the legs, thorax, and abdomen, the unspotted wings, and in the details of venation.

Orimarga (*Orimarga*) *scabriseta*, sp. n.

Allied to *funerula* ; general coloration black, the lateral margin of præscutum and the thoracic pleura striped longitudinally with silvery; halteres and legs black; wings long and slender, strongly suffused with blackish; vein R_{1+2} long, approximately one-half *Rs*; *m–cu* about opposite three-fourths the length of *Rs*; male hypopygium with the setæ of basistyle unusually abundant and placed close together, each with microscopic lateral branches scattered over the length.

Male.—Length about 9–10 mm.; wing 6·5–7 mm.

Rostrum black, subequal in length to remainder of head; palpi black. Antennæ black throughout; flagellar segments oval. Head light grey pruinose; anterior vertex a little wider than the diameter of scape.

Thorax black, the lateral border of præscutum narrowly silvery; pleura with a silvery longitudinal stripe, together with a more poorly defined grey-pruinose area extending from beneath the wing-root to above the halteres. Halteres black. Legs with the coxæ black; trochanters dark brown; remainder of legs black. Wings long and narrow, with conspicuous basal petiole; almost the entire surface strongly suffused with brownish black; prearcular area whitened, except for the veins; ill-defined darker brown seams in radial field; entire medial field, excepting vein M_3, with the veins narrowly bordered by pale; veins dark. Venation: almost as in *funerula*; R_1 between free tip of Sc_2 and R_2 subequal to R_{2+3}; R_{1+2} elongate, approximately one-half the long *Rs*; *m–cu* almost in oblique alignment with the free tip of Sc_2, nearly opposite three-fourths the length of *Rs*; cell *2nd A* narrow.

Abdomen, including hypopygium, black. Male hypopygium much like that of *funerula* but quite distinct. Basistyle with two unusually dense groups of setæ, these placed so close together that the punctures are contiguous; setæ roughened by microscopic lateral branches, almost like the thoracic hairs of a bee. Apical knob of gonapophysis more rounded and set with numerous blunt points.

Hab. Ecuador (Oriente).

Holotype, ♂, Baños, Tungurahua, altitude 2000 metres, May 25, 1937 (*Macintyre*). *Paratopotype*, ♂.

Orimarga (*Orimarga*) *scabriseta* is very similar to *O.* (*O.*) *funerula* Alexander (Peru), but differs conspicuously in the peculiar nature of the long abundant setæ of the basistyle, each of which is roughened by numerous lateral branches. These two species are readily told from other regional members of the genus by the very strongly blackened wings.

Helius (*Helius*) *ineptus*, sp. n.

Thorax pale yellow; rostrum longer than remainder of head, dark brown; antennæ black; legs brown, the outer tarsal segments paling to yellow; wings whitish subhyaline, unpatterned except for the pale brown stigma; *r–m* distinct, cell *1st* M_2 wide, shorter than any of the veins beyond it, *m–cu* beyond mid-length; male hypopygium with the outer dististyle bifid near apex, the outer spine very small

Male.—Length about 4·5–5·3 mm.; wing 5–6 mm.

Rostrum longer than the remainder of head, dark brown; palpi black. Antennæ relatively short, black throughout; flagellar segments short-oval, the outer ones more lengthened. Head blackish grey.

Thorax almost uniformly pale yellow, præscutal setæ black, erect. Halteres with stem yellow, knob broken. Legs with coxæ and trochanters yellow; remainder of legs brown, the outer tarsal segments paling to white; claws simple. Wings whitish subhyaline, unpatterned except for the pale brown oval stigma; veins brown, paling to yellow on basal third of wing. Venation: Sc_1 ending about opposite three-fourths to four-fifths *Rs*, Sc_2 near its tip; branches of *Rs* gently divergent, cell R_3 at margin about one-fourth more extensive than cell R_2; basal section of R_{4+5} distinct; *r–m* short; cell *1st* M_2 wide, much shorter than any of the veins beyond it, *m–cu* beyond mid-length.

Abdominal tergites pale brownish yellow, darker laterally; subterminal segments darker brown; hypopygium more reddish brown. Male hypopygium with the outer dististyle relatively small and slender, bifid near apex by a very small sublateral spine. Inner dististyle much longer, nearly straight. Lateral arms of tergite appearing as relatively narrow blades that gradually narrow to subacute tips. Basistyle without mesal armature.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, Rio Pastaza, altitude 1200 metres, September 21, 1937 (*Macintyre*). *Paratopotypes*, 1 ♂, August 20, 1937; 1 ♂, September 20, 1937.

Helius (*Helius*) *ineptus* is readily told by the pale yellow coloration of the body, in conjunction with the whitish subhyaline, unpatterned wings.

Helius (*Helius*) *lobuliferus*, sp. n.

Belongs to the *albitarsis* group; general coloration black; terminal tarsal segments whitened; wings with a brown tinge; *m–cu* far distad, at from two-thirds to three-fourths the length of the cell; abdomen black; male hypopygium with the basistyle bearing a slender finger-like lobe on ventro-mesal face; inner dististyle unusually long; interbases appearing as strongly curved flattened blades.

Male.—Length about 6·5 mm.; wing 7 mm.

Female.—Length about 6·5 mm.; wing 6·5 mm.

Rostrum of moderate length, subequal to remainder of head, black throughout; palpi black. Antennæ black throughout, short; flagellar segments long-oval, the verticils very long. Head black; anterior vertex much reduced.

Thorax uniformly brownish black to black. Halteres dusky, the knobs infumed. Legs with the coxæ dark brown, the posterior pair somewhat paler; trochanters dark; remainder of legs black, the outer tarsal segments restrictedly whitened, involving the four outer segments and the extreme tip of basitarsus. Wings with a brown tinge, the long-oval stigma darker brown; veins dark brown. Venation: Sc_1 ending just before fork of *Rs*, Sc_2 at its tip; *r–m* reduced to a point by approximation of veins; *m–cu* far distad, at from two-thirds to three-fourths the length of the cell.

Abdomen brownish black; hypopygium black. Male hypopygium with a slender, finger-like lobe on the ventro-mesal face of basistyle at near two-thirds the length. Outer dististyle small, curved, with a small subterminal spine. Inner dististyle unusually long, about twice the length of the outer, the distal half prolonged into a slender pale point. What appear to represent interbases are strongly curved blades, the tips acute.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, Rio Pastaza, altitude 1200 metres, April 5, 1937 (*Macintyre*). *Allotopotype*, ♀.

Helius (*Helius*) *lobuliferus* is readily told from other members of the *albitarsis* group by the structure of the male hypopygium, as the lobed basistyles and the strongly flattened interbases.

Helius (*Helius*) *melanophallus*, sp. n.

Size very small (wing, male, under 4 mm.); general coloration brownish black; tarsi, including more than distal half of basitarsi, snowy white; wings with a strong dusky tinge; *r–m* obliterated by punctiform contact of veins R_{4+5} and M_{1+2}; abdomen, including hypopygium, black; male hypopygium with the outer dististyle only a little shorter than the inner style, the latter with apical portion relatively stout; interbases appearing as slender curved spines; ædeagus black.

Male.—Length about 3·5 mm.; wing 3·8 mm.

Rostrum and palpi black. Antennæ black throughout, relatively long; flagellar segments oval to long-oval, with coarse erect setæ. Head dark.

Mesonotum brownish black, the pleura somewhat paler. Halteres dark throughout. Legs with the coxæ dark, trochanters paler; femora, tibiæ, and basal two-fifths of basitarsi brownish black, the remainder of tarsi snowy white; claws long, simple. Wings with a strong dusky tinge, the elongate stigma a trifle darker than the ground; veins dark. Venation: *Sc* long, Sc_1 ending opposite the fork of *Rs*, the longer Sc_2 some distance beyond this point; branches of *Rs* rather strongly divergent at outer ends, so cell R_3 is wider at margin than cell R_2; *r–m* obliterated by punctiform contact of veins R_{4+5} and M_{1+2}; cell *1st* M_2 widest across base; *m–cu* at near mid-length of lower face of cell *1st* M_2, subequal to either section of M_{3+4}.

Abdomen, including hypopygium, black. Male hypopygium with the basistyle unprovided with lobes. Outer dististyle only a little shorter than the inner, strongly curved near outer end, with a small subterminal spine. Inner dististyle with apex relatively stout. What appear to represent interbases are slender, curved spines. Ædeagus relatively simple but elongate, black, only the tip pale.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, Rio Pastaza, altitude 1200 metres, April 18, 1937 (*Macintyre*).

Helius (*Helius*) *melanophallus* is the smallest species of the *albitarsis* group so far made known. The structure of the male hypopygium readily separates it from all other known species of the group.

Helius (*Helius*) *invariegatus*, sp. n.

General coloration black, the præscutum and scutum more reddish brown; halteres yellow; legs black, the outer tarsal segments paler; wings with a weak brown tinge, stigma and a vague seam along cord darker; cell 1st M_2 subrectangular, with *m–cu* at near one-third the length; abdominal tergites weakly bicoloured, black, the apical half brown, the basal sternites more brightened; male hypopygium with the tergite conspicuously produced; basistyle with mesal lobe; outer dististyle a slender simple rod; inner dististyle expanded outwardly, bilobed, the outer lobe flattened, the apex obtusely rounded; ædeagus unusually long and slender.

Male.—Length about 4 mm.; wing 4·5 mm.

Female.—Length about 4·5 mm.; wing 4·8 mm.

Rostrum black, about one-half the length of remainder of head; palpi black. Antennæ black throughout. Head greyish brown.

Pronotum black. Mesonotum with præscutum and scutum variegated with reddish brown, the remainder black. Pleura uniformly black. Halteres yellow. Legs with the coxæ and trochanters black; remainder of legs black, the outer tarsal segments paling to brownish yellow; no brightening at genua. Wings with a weak brown tinge, the prearcular field and costal border slightly more yellow; stigma small, oval, slightly darker brown; a narrow, poorly indicated, dusky seam along cord; veins brown, yellow in the flavous areas. Venation: Sc_1 ending about opposite two-thirds the length of the nearly straight *Rs*; branches of *Rs* divergent, cell R_3 a little wider at margin than cell R_2; cell 1st M_2 subrectangular, with *m–cu* at near one-third the length.

Abdominal tergites weakly bicoloured, the bases black, the distal half brown; basal sternites more conspicuously bicoloured, the brown apex replaced by yellow; hypopygium black. Male hypopygium of the general type of *myersiellus* ; tergite conspicuously produced, the apex a little dilated, truncate. Basistyle slender, the mesal face with a conspicuous dusky lobe. Outer dististyle a slender, nearly straight, simple rod. Inner dististyle expanded outwardly, longer than the outer, bilobed at apex, the inner lobe slender, with setæ to tip ; outer lobe flattened, the apex obtusely rounded. Ædeagus unusually long and very slender, hair-like on outer portion, the total length exceeding three times the basistyle.

Hab. Ecuador (Oriente).

Holotype, ♂, Abitagua, Rio Pastaza, altitude 1200 metres, September 22, 1937 (*Macintyre*). *Allotopotype*, ♀, September 21, 1937.

The nearest relatives are *Helius* (*Helius*) *albogeniculatus* Alexander and *H.* (*H.*) *myersiellus* Alexander, both of Brazil, which differ in the conspicuously whitened femoral tips, the wing-pattern, and in the details of structure of the male hypopygium.

Helius (*Helius*) *panamensis lateralis*, subsp. n.

Female.—Length about 6·5 mm. ; wing 5·8 mm.

Similar to the typical form, differing in details of colour.

Rostrum yellow, a little longer than the remainder of head ; palpi pale, the outer segments darker. Antennæ with scape and pedicel pale yellow, flagellum a little darker ; basal flagellar segments nearly globular, small and crowded, the outer segments longer, with more conspicuous verticils. Head grey.

Pronotum yellow. Mesonotum pale yellow, the mediotergite black, sending cephalad a narrow lateral line involving the dorsal pleurites, passing beneath the wing-root, nearly if not quite interrupted at the suture and including the broad præscutal margins between the suture and pseudosutural foveæ. Pleura yellow. Halteres pale yellow. Legs yellow, the femoral tips narrowly but conspicuously blackened. Wings yellow, sparsely patterned with brown, as in the typical form ; stigma oval, brown ; paler clouds at cord, before mid-length of vein *Cu*, and as a seam in the outer medial and cubital fields ; veins yellow, a little darker in the clouded areas, Venation: *r–m* at or shortly before fork of *Rs*; *m–cu* shortly beyond fork of *M*.

Abdominal tergites yellow, vaguely patterned with darker; sternites uniformly yellow.

Hab. Ecuador (Oriente).

Holotype, ♀, Abitagua, Rio Pastaza, altitude 1200 metres, September 21, 1937 (*Macintyre*).

LI.—*The Vertical Distribution of some Reptiles and Amphibians in Southern Ecuador.* By H. W. PARKER, B.A., Department of Zoology, British Museum (Natural History).

ALTHOUGH in recent years a certain amount of attention has been devoted to the study of the geographical distribution of reptiles and amphibians in the Neotropical region, particularly in Central America, very little accurate information is at present available as regards the vertical distribution of these animals along the Andean chain. Professor Clodoveo Carriòn of the University of Loja has endeavoured to remedy this deficiency over the area in which he works and the following notes are offered as a contribution towards the study of the faunal zones of the Andes. First there is an annotated list of the specimens recently obtained by Professor Carriòn at various altitudes both to the east and west of the Andean watershed and then a summary of the species previously collected in the province of Loja. Altitude alone probably has only a minor effect upon the distribution of plants and animals, a more important role being played by the concomitant factors of temperature and humidity which are influenced also by latitude and physiographical conditions. Altitudinal figures are consequently no index of the physical conditions prevailing, and so complex are the various factors involved that no simple physical measurement will provide a satisfactory index. Instead it is more convenient to consider the vegetational zones which are more or less clearly defined, but which naturally are not abruptly marked off one from the other. In southern Ecuador there are three major zones on each side of the central watershed :—(1) A humid tropical zone of limited extent on the Pacific side in the province of Oro at altitudes up to 3,000 feet; a similar zone occurs in the Amazon drainage of the Zamora River at altitudes below 3,250 feet. (2) An arid tropical and subtropical zone which on the western side of the mountains extends up to 6,000 or 7,000 feet and probably links up with the coastal deserts of northern Peru in the Catamayo Valley; on the eastern slopes it extends approximately between 3,000 and 6,000 feet. (3) An arid temperate zone immediately above the latter on both sides of the watershed. The following are the localities in which the recent collections were made :—

(1) Humid Tropical :
  (*a*) West, Porto Velho, Prov. Oro.
  (*b*) East, Zamora Valley, 3,250 feet.

(2) Arid Tropical and Subtropical :
  (*a*) West, Catamayo Valley.
  (*b*) East, Malacatas Valley ; Zamora Valley.

(3) Arid Temperate :
  East, Loja City (7,200 feet) and neighbourhood.

Much remains to be done before any generalisations are possible but the following notes may form a basis for further work. The author wishes to express his gratitude to Professor Carriòn for the opportunity of examining so much interesting material and for furnishing the data necessary to such a survey.

AMPHIBIA.

SALIENTIA.

Bufo marinus (Linn.).

♀, Catamayo Valley, 4,780 feet.

Bufo typhonius (Linn.).

2 ♂♂, ♀, Zamora, 3,250 feet.

Phyllobates pulchellus (Espada).

2 ♀♀, juv., Loja City, 7,200 feet.

Atelopus ignescens (Corn.).

3 ads., Loja City, 7,200 feet.
1 ad., 40 kilometres S. of Loja, 11,000 feet.
1 ad., 15 kilometres E. of Loja, 9,750 feet.

As in the series previously reported upon (Parker, 1934, p. 268) the specimens from Loja are uniform saffron yellow. These from the higher altitudes to the east and south resemble others from the Zamora in the eastern tropical and subtropical arid zone in being black above and yellow beneath (green in life) so that these two colour-phases cannot be altitudinal races.

Eleutherodactylus gollmeri (Peters).

2 ♂♂, ♀ juv., Zamora, 3,250 feet.

Eleutherodactylus carrioni Parker.

♂, Catamayo Valley, 4,700 feet.
Juv., Loja City, 7,200 feet.

? *Eleutherodactylus vertebralis* (Boul.).

E. latidiscus (non Boul.) Parker, 1934, Ann. & Mag. Nat. Hist. (10) xiv. p. 267.

♀, Zamora, 3,250 feet.

This example and the other from the same locality which was previously misidentified as *latidiscus*, agree well with the types of *vertebralis* except that the tympanum is a little smaller (one-third the diameter of the eye instead of two-fifths), the tibio-tarsal articulation reaches nearly to the nostril (instead of the eye), and the lower surfaces are somewhat darker. It seems very possible, in view of the plasticity of the genus, that these differences really indicate specific or racial differentiation, but insufficient material is available to resolve the question.

Eleutherodactylus flavomaculatus, sp. n.

Holotype a female, number 1935.11.3.16 in the British Museum, collected 15 kilometres east of Loja City, Ecuador, at an altitude of approximately 3,000 metres, by Prof. Clodoveo Carriòn.

Head a little broader than long, depressed; edges of the fronto-parietals upturned to form two longitudinal ridges and the surface of the bone with secondary rugose ossification. Tongue oval, entire. Vomerine teeth in two short series, close together, well behind the level of the choanæ. Snout rounded, not prominent, once and a quarter as long as the eye, with obtuse canthus rostralis and very oblique, concave, loreal region; nostril slightly nearer the tip of the snout than the eye; tympanum small, its vertical diameter a little less than half that of the eye; interorbital space once and a half as broad as the upper eyelid. Digits without discs, but with T-shaped terminal phalanges. Fingers moderate, the first and second subequal, shorter than the fourth. Toes free, the third extending a little beyond the fifth; subarticular tubercles moderately well-developed; two rounded metatarsal tubercles. Tibio-tarsal articulation reaching the anterior corner of the eye. Skin smooth above and below; a slight supratympanic fold. Posterior surface of the thighs in the anal region feebly granular.

Uniform dark purplish brown above; paler brown beneath; hinder side of upper arm, groin, posterior half of abdomen, lower surfaces of the thighs and concealed surfaces of the legs with large or small, conspicuous, circular, yellow spots which, beneath the thighs and on the belly tend to run together. The two inner fingers white (? red in life).

Length from snout to vent	40 mm.
Fore limb	24 mm.
Hind limb	69 mm.

The paratypes, 1935.11.3.17–20, a male and three immature females from the type locality, do not differ appreciably from the holotype in morphological characters, but there are some colour differences. There is usually an indistinct light interorbital bar and some indefinite lighter vertical bars on the upper lip, whilst one female has a pink dorso-lateral stripe running from the upper eyelid almost to the groin. The white inner fingers are always present, and the yellow maculations of the lower and concealed surfaces; but on the belly they may run together completely, so that it is uniformly yellow, and there may be a light line along the hinder side of the thighs from the vent to the back of the knee. The male has a vocal sac opening by a slit on each side of the tongue, This species is undoubtedly one of the "*Eupsophus*" group of species and has the greatest affinities with *E. buckleyi*. This is particularly noticeable in the broad, depressed head, fronto-parietal ridges and secondary dermal rugosity of the skull, as well as in the reduction of digital discs. If the latter alone were considered the species would have to be referred to *Eupsophus*, but since the terminal phalanges are definitely T-shaped it is more convenient to retain it in *Eleutherodactylus*. It differs from *E. buckleyi* in the entire absence of digital discs, the smooth skin, longer first finger, and colouration.

Leptodactylus curtus Barbour & Noble.

♂. Catamayo Valley, 4,700 feet.

This species has hitherto only been recorded from the Amazon drainage of Peru, in the Upper Maranon Valley.

Gastrotheca marsupiata lojana Parker.

2 ♂♂, 3 ♀♀, 2 juvs., Loja City, 7,200 feet.

REPTILIA.

SAURIA.

Amphisbæna fuliginosa Linn.

1, Zamora, 3,250 feet.

Leiocephalus ornatus ornatus Gray.

♂, Malacatos Valley, 5,187 feet.
♀, Vicinity of Loja City, 7,280 feet.
♀ juv., Catamayo Valley.

This species constantly has large, deep, mite pockets in the axillæ and behind the femora.

Tropidurus occipitalis occipitalis Peters.

4 ♂♂, 3 ♀♀, 3 juvs., Catamayo Valley, 4,780 feet.

Polychrus femoralis Werner.

2 ♀♀ juv., Catamayo Valley, 4,780 feet.
♀, Hacienda da Juannes, Catamayo Valley, 5,300 feet.

Stenocercus humeralis (Günther).

♂, 2 ♀♀, Loja City, 7,280 feet.

Iguana iguana (Linn.).

Juv., Vicinity of Portovelo, Prov. Oro, 3,000 feet.
Juv., Catamayo Valley, 4,725 feet.

Ameiva edracantha Bocourt.

♂, Catamayo Valley.

Ameiva septemlineata Dum.

♂ juv., Porto Velho, Prov. Oro.

Dicrodon lentiginosus (Garman).

Juv., Catamayo Valley, 4,700 feet.

Mabouya mabouya (Lacépède).

Ad., Porto Velho, 2,000 feet. Prov. Oro.
Ad., Zamora, 3,250 feet.

The example from Porto Velho is the most southerly record for the species west of the Andes.

SERPENTES.

Leptotyphlops albifrons (Wagler).

2 ads., Catamayo Valley.

Eudryas boddaerti boddaerti (Sentzen).

2 juv. ♀♀ (v. 191, 192; c. ?, 112+1), Porto Velho, 2,000 feet.

Dendrophidion dendrophis (Schlegel).

♂ (v. 154; c. 172+1), Zamora, 3,250 feet.

Specimens of this species from the southern parts of its range have a much higher number of subcaudals than those from the north. The above specimen has an even higher number than usual but otherwise agrees well with the species. Should it be possible to recognise a distinct Ecuadorian race the name *brunneus* (Günther), based on a specimen from Guayaquil, is probably available, though the type, like so many other specimens in collections, has a mutilated tail.

Drymarchon corais melanurus (Dum. & Bibr.).

♂ (v. 200; c. 79+1), Catamayo Valley, 4,700 feet.
♀ (v. 208; c. 73+1), Catamayo Valley, 5,300 feet.

Leimadophis simonsi (Boul.).

♀ (v. 193 ; c 123), Catamayo Valley, 4,700 feet.

Lygophis tæniurus tæniurus (Tschudi).

♂, ♀ (v. 153, 157 ; c. 64+1, 66+1), Loja City, 7,280 feet.

Lygophis sp.

Juv. ♂ (v. 147 ; c. 72+1), Zamora Valley, 3,250 feet.

This very young specimen may represent an undescribed species allied to *taeniurus* but differing in a shorter snout and lower number of ventrals. It is, however, too young to be satisfactory material on which to base definite conclusions.

Xenodon severus (Linn.).

♀ juv. (v. 144, 134; c. 40+1, 40+1), Zamora, 3,250 feet.

Lampropeltis micropholis (Cope).

2 ♀♀ (v. 217, 218 ; c. 40+1, 44+1), Catamayo Valley, 4,600 feet.

Atractus carrioni Parker.

4 ♂♂, ♀ (v. 147, 149, 149, 142, 160 ; c. 34, 30, 32, 30, 23+1), Loja City, 7,280 feet.

Dipsas mikanii oreas (Cope).

♂, 2 ♀♀ (v. 181, 181, 178 ; c. 52+n, 75+1, 67+1), Catamayo Valley, 4,700 feet.

♂ (v. 178 ; c. 85+1), Loja City, 7,280 feet.

The last-mentioned of the two females from the Catamayo Valley differs from other specimens in having a smaller eye, a higher and narrower rostral, and the first labial in contact with the loreal ; it may possibly represent a distinct species.

Pseudoboa fitzingeri (Tschudi).

2 ♂♂ (v. 190, 188 ; c. 70+1, 72+1), Catamayo Valley 4,700 feet.

Philodryas elegans (Tschudi).

2 juv. ♀♀ (v. 192, 194 ; c. 86+1, 87+1), Catamayo Valley, 4,700 feet.

Oxybelis acuminatus (Wied.).

♀ (v. 186 ; c. 156+1), Catamayo Valley, 4,700 feet.
Juv. (v. 186 ; c. 148+1), Malacatos Valley, 5,187 feet.

Erythrolamprus æsculapii, subsp.

♂ (v. 189 ; c. 51+1), Zamora Valley, 3,250 feet.

This is a very dark specimen with twenty-four black annuli on the body, each about three-quarters as wide as the interspace separating it from its neighbour ; these red interspaces are heavily dusted with black and the upper surfaces of the head are completely black. The fangs lack all trace of a groove.

Tantilla melanocephala (Linn.).

Juv. ♀ (v. 158 ; c. 48+1), Catamayo Valley.
Juv. (bad state), Malacatos Valley, 5,187 feet.

Stenorhina degenhardti (Berthold).

2 ♂♂, 3 ♀♀ (v. 139, 142, 154, 157, 153 ; c. 39, 41, 34, 37, 33+1), Catamayo Valley, 3,700 feet.

2 juvs. (v. 144, 144 ; c. 41, 44+1), Porto Velho, Prov. Oro, 2,000 feet.

Micrurus tschudii (Jan).

Juv. ♂ (v. 191 ; c. 25+1), 2 juv. ♀♀ (v. 195, 196 ; c. 26+1, 26+1), Catamayo Valley, 4,780 feet. Arid Tropical Zone.

These three specimens agree more closely with the typical subspecies than with the scarcely distinguishable northern race *olssoni*. But they differ from either in having the 13–14 triads more definitely marked, the red interspaces between each being wider than the yellow annuli of each triad.

Micrurus mipartitus (Dum. & Bibr.).

Juv. ♂ (v. 266 ; c. 31+1), Catamayo Valley, 4,780 feet.

Micrurus ecuadorianus Schmidt.

♀ (v. 221 ; c. 33+1), Catamayo Valley, 4,780 feet.

Seventeen black annuli on the body and four on the tail ; each yellow bar is edged with black thus forming rudimentary triads of black annuli.

Micrurus mertensi Schmidt.

2 ♂♂ (v. 210, 216; c. 44+1, 43+1).

4 ♀♀ (v. 236, 230, 234, 232; c. 35, 35, 31, 33+1), Catamayo Valley, 4,780 feet.

1 ♀ (v. 225; c. 32+1), Hacienda Juanes, 5,295 feet (Catamayo Valley).

M mertensi, as hitherto understood, is a coastal form from N.W. Peru (Pacasmayo and Chanchamayo) whilst *M. ecuadorianus* is the coastal form of Ecuador from the province of Guayaquil. The Catamayo River drains into the Pacific Ocean midway between the recorded ranges of the two, and specimens referable to both species have been collected in the valley. Whether this indicates that the two meet here without intergradation or that the population is intermediate in character with individuals which might be referred to either is a little uncertain, for only a single female of "*ecuadorianus*" is present and the specimens here named *mertensi* are not quite typical; the caudal counts of the males are lower and approach those of *ecuadorianus*.

But the single female referred above to *ecuadorianus* differs from the other five females from the same locality (which are referred to *mertensi*) in a lower number of black annuli, both on the body and tail, and the development of accessory black rings bordering the yellow annuli; this suggests that the two might, indeed, be specifically distinct, but the probability seems to be rather that the two intergrade.

The following table shows the characters involved :—

Species.	Locality.	Ventrals.		Caudals.		Annuli.			Accessory black rings.
						Body.	Tail.		
		♂.	♀.	♂.	♀.		♂.	♀.	
M. ecuadorianus .	Type localities.	200–209	214–223	43–48	33–35	14–20	5–7	4	+
M. ecuadorianus .	Catamayo Valley.	..	221	..	34	17	..	4	+
M. mertensi ...	Catamayo Valley.	210–216	235–236	43–45	31–35	22–30	6–9	6	—
M. mertensi ...	Type localities.	210–221	232–235	47–51	33–37	22–28	8	5	—

Bothrops lojana Parker.

3 ♂♂, 2 ♀♀ (v. 149, 153, 154 ; 150, 155 ; c. 39, 38, 41 ; 37 ?). Loja City, 7,280 feet.

Vernacular name "macaucho."

Bothrops castelnaudi Dum. & Bibr.

Juv. ♂ (c. 25 ; v. 211 ; c. 71+1), Zamora, 3,250 feet.

Bothrops barnetti, sp. n.

In view of the fact that the Catamayo Valley appears to form a route by which many reptiles of the desert coastal plain reach the arid regions of the mountains it may not be out of place to describe here a new species of pit-viper from the coastal area. This appears to be a derivative of the common *Bothrops atrox* which it greatly resembles, but from which it may be distinguished by its smaller size, the lower number of subcaudals and the enlarged terminal scute of the tail.

Holotype a male, number 1926.3.24.40 in the British Museum, from the mouths of the Quebradas Honda and Perines, between Lobitos and Talara, northern Peru ; collected by Dr. Burgess Barnett. Paratypes a ♀ (1931.10.7.7) and a ♂ (1932.9.5.13) from Lobitos, also collected by Dr. Barnett. Since the two paratypes have damaged snouts and the type a mutilated tail it is preferred to give a composite description rather than detailed descriptions of the individuals.

Snout pointed, with sharp, distinctly raised, canthus rostralis. Rostral as high as broad ; nasal divided ; upper head-scales keeled, imbricate, in six series between the supraoculars which are large ; internasals large, in contact mesially ; canthals large, separated from each other by two or three scales and from the supraocular by one ; two or three postoculars and one or two suboculars separated from the labials by one row of scales ; upper temporals feebly keeled, lower smooth ; seven to nine upper labials, the second (in the paratype ♂ the third on one side) forming the anterior border of the loreal pit and semidivided horizontally in front. Scales in 23 (holotype) or 25 (paratype) rows with strong keels which reach the extremities of the scales. Ventrals 172, 179, and 176, caudals 35+n, 46+1 and 42+1 in

	Previous records.		New zonal records.					
			Pacific drainage.			Eastern drainage.		
	Pacific drainage.	Eastern drainage.	Humid Tropical.	Arid Tropical and Subtropical.	Arid Temperate.	Arid Temperate.	Arid Tropical and Subtropical.	Humid Tropical.
Bufo cæruleostictus	+	+	..	..	+	..	..	+
B. marinus	+	+	..	+				
B. spinulosus	+	+	..	..	..	+		
B. typhonius	+	+	..	..	..	..	..	+
Phyllobates pulchellus	+	+	..	..	..	+	..	+
Atelopus ignescens	+	+	..	..	..	+	..	+
Leptodactylus curtus	..	+	..	+				
L. caliginosus	..	+	..	..	..	..	..	+
Eleutherodactylus bisignatus	..	+	..	..	..	..	..	+
E. carrioni	..	+	..	+	..	+	+	+
E. flavomaculatus	..	..	..	..	..	+		
E. gollmeri	+	+	..	..	..	..	..	+
E. vertebralis	+	..	..	..	..	..	..	+
Lithodytes lineatus	..	+	..	..	..	..	..	+
Telmatobius niger	+ ?	..	..	..	..	+		
Centrolene pulveratum	..	+	..	..	+	..	..	+
Hyla calcarata	..	+	..	..	..	..	..	+
H. rhodopepla	..	+ ?	..	..	..	..	..	+
Gastrotheca marsupiata lojana	..	+	..	..	..	+	..	+
Cæcilia pachynema	+	..	..	..	..	..	..	+
? *Rhinatrema bicolor*	..	+	..	..	..	..	..	+
Amphisbæna fuliginosa	+	+	..	..	..	..	..	+
Anolis fuscoauratus	+	+	..	..	..	..	..	+
A. ortoni	+ ?	+	..	..	..	..	..	+
Leiocephalus ornatus ornatus	+	+	..	+	..	+	+	
Tropidurus occipitalis occipitalis	+	..	..	+				
Polychrus femoralis	+	..	..	+	..	+		
Stenocercus humeralis	+	+	..	..	..	+		
S. varius *	+	+						
S. carrioni	..	+	..	..	..	..	..	+
Iguana iguana	+	+	+	+				
Enyalioides præstabilis	..	+	..	..	..	..	..	+

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* Recorded from Loja under the name *S. boettgeri* (a synonym) by Burt, 1930, Proc. U.S. Nat. Mus. lxxviii. p. 22.

	Previous records.		New zonal records.					
			Pacific drainage.			Eastern drainage.		
	Pacific drainage.	Eastern drainage.	Humid Tropical.	Arid Tropical and Subtropical.	Arid Temperate.	Arid Temperate.	Arid Tropical and Subtropical.	Humid Tropical.
Ameiva edracantha	+	..	+					
A. septemlineata	+	..	..	+				
Dicrodon lentiginosus	+	..	..	+				
Macropholidus annectens	..	+	..	..	..	+	..	+
Pantodactylus buckleyi festæ	+	..	..	..	..	..	..	+
Pholidobolus montium	+	..	..	..	..	..	..	+
Prionodactylus vertebralis	+	+	..	..	..	..	..	+
Mabouya mabouya	+	+	+	..	..	..	..	+
Leptotyphlops albifrons	+	+	..	+				
Eudryas boddaerti boddaerti	+	+	+	..	..	..	..	+
Dendrophidion dendrophis	+	+	..	..	..	..	+	
Drymarchon corais melanurus	+	..	..	+				
Chironius carinatus	+	+	..	..	..	+		
Leimadophis simonsi	..	+	..	+	..	+		
Lygophis tæniurus tæniurus	+	+	..	..	..	+		
Xenodon severus	+	+	..	..	..	..	+	
Lampropeltis micropholis	+	+	..	+				
Atractus carrioni	..	+	..	..	..	+		
A. major	+	+	..	..	..	+	..	+
Dipsas mikanii oreas	+	+	..	+	..	+		
D. palmeri	..	+	..	..	..	..	..	+
Pseudoboa clœlia	+	+	..	..	..	+		
P. fitzingeri	+	+	..	+				
P. petola	+	+	..	..	..	+	..	+
Philodryas elegans	+	..	..	+				
Oxybelis acuminatus	+	+	..	+	..	..	+	
Erythrolamprus æsculapii	+	+	..	..	..	..	..	+
Tantilla melanocephala	+	+	..	+	..	..	+	
Stenorhina degenhardti	+	+	+	+				
Micrurus ecuadorianus	+	..	..	+				
M. mertensi	+	..	..	+				
M. mipartitus	+	+	..	+				
M. tschudii	+	..	..	+				
Bothrops alticola	..	..	..	..	..	+		
B. castelnaudi	..	+	..	..	..	..	+	+
B. lojana	..	+	..	..	..	+		

the holotype, paratype ♂ and paratype ♀ respectively; the terminal caudal scute very large, fusiform, as long as the last six subcaudals.

Pale brown or straw colour above; a Λ-shaped, dark marking on the head following its contour, but leaving the supraoculars and the cantho-rostral edge lighter. Body with 18 to 20 dark brown, light-edged cross-bars which are narrower mesially and may be broken and alternate anteriorly; the outer ends of these bars are light-centred, and in the holotype an indistinct light zone on the fifth and sixth scale rows cuts off the outer portion as a pair of dark blotches Belly uniform white except at the extreme outer ends of the ventrals which may be dark-dusted.

	Holotype ♂.	Paratype ♀.
Length from snout to vent	515 mm.	713 mm.
Tail	58 mm.+	82 mm.

This species has many features in common with *B. atrox* Linn., but is much smaller, has a lower number of subcaudals (in 697 examined by Amaral the range is from 50–75) and a much larger terminal caudal scute; in this latter character it resembles *B. neuwiedii* and *B. ammodytoides*

LII.—*New Records of African* Scolytidæ *and* Platypodidæ (*Col.*).—*54th Contribution*. By Karl E. Schedl.

The following list, giving new localities and food-plants of rare and interesting species, has been compiled exclusively from material which has been sent to me by the Imperial Institute of Entomology. Among the commoner species I may mention *Pityogenes opacifrons* Reitt., which has been taken in Palestine, Balad esh Sheik, from *Pinus halepensis*, together with *Hylurgus micklitzi* Wachtl, *Orthotomicus erosus* Woll., and *Crypturgus numidicus* Ferr. Among the new species found, the type of a new genus *Traglostus* is very interesting.

Locality and Food-plant Records.

Xyloctonus scolytoides Eichh. Athi Falls, Kenya Col., Nov. 1934 (*A. F. J. Gedye*).

Cyrtogenius africanus Egg. Osri, N. Kavirondo, June 1934 (*H. J. A. Turner*); Homa, South Kavirondo, Nov., Dec. 1934 (*H. J. A. Turner*).

Coccotrypes ghesquieri Egg. Sierra Leone, Njala, ex palm kernel, Feb. 1932 (*E. Hargreaves*).

Premnobius ambituosus Hag. Sierra Leone, Njala, on furniture, July 1934 (*E. Hargreaves*).

Xyleborus ægir Egg. Tanganyika Ty., Lushota.

Xyleborus coffeæ Wurth. Nairobi, Kenya C., 23. i. 1938 (*R. H. Le Pelley*), boring shoots of *Dendrobium* sp.

Xyleborus badius Eichh. Voi, xii. 1936 (*MacArthur*).

Xyleborus mascarensis Eichh. Voi, xii. 1936 (*MacArthur*); Uganda, Kampala, 24. vii. 1935, ex dried sugar-cane.

Xyleborus subtuberculatus Egg. Uganda, Pingiri Jeso, 2. i. 1922, on cotton.

Xyleborus confusus Eichh. Homa, South Kavirindo, Nov., Dec. 1934 (*H. J. A. Turner*); Kisumu, Kenya C., iii. 1936 (*Turner*); Voi, xii. 1936 (*MacArthur*).

Crossotarsus ve-grandis Samps. Gold Coast, Dunkwa, W.P., boring in *Cedrela mexicana*, Sept. 1931 (*G. S. Cotterell*).

Crossotarsus opifex Samps. Belgian Congo, Madi, May 1927, 18 miles S.W. Elisabethville, 1927 (*Dr. H. S. Evans*); N. Rhodesia, Congo-Zambesi Watershed, 1928 (*Dr. H. S. Evans*); N. Rhodesia, N'Changa, 1931 (*C. T. Macnamara*).

Crossotarsus bohemani Chap. Sudan, Ajwon, 17. x. 1933. on steamer (*A. D. Sherrat*).

Crossotarsus crinitus var. *dubius* Samps. N. Rhodesia, N'Changa (*C. T. Macnamara*).

Crossotarsus crinitus Chap. Rhodesia, Salisbury, Feb. & April 1895 (*Sir Guy Marshall*).

Crossotarsus spatiosus Schedl. Rhodesia, Salisbury, April 1895, Nov. 1899 (*Sir Guy Marshall*).

Crossotarsus præclarus Schedl. Belgian Congo, 18 miles S.W. Elisabethville, 1927 (*Dr. H. S. Evans*); Angola, Lobito, 1. v. 1934 (*K. Jordan*).

Crossotarsus arrowi Schedl. Rhodesia, Salisbury, April 1895 (*Sir Guy Marshall*).

Crossotarsus rapax Samps. Uganda, Kampala, 3780 ft., Nov., Dec. 1920 (*A. F. J. Gedye*).

Crossotarsus lobatus Schedl. Tanganyika Ty., Shinyanga, 4. i. 1935 (*E. Burt*).

Crossotarus propatulus Schedl. Belgian Congo, 18 miles S.W. Elisabethville (*Dr. H. S. Evans*).

Crossotarsus mimicus Schedl. N. Rhodesia, N'Changa (*C. T. Macnamara*).

Crossotarsus pilosulus Schedl. Angola, Congulu, April 1934 (*K. Jordan*).

Crossotarsus erichsoni Chap. Kenya C., Thika, Jan. 1927 (*A. F. J. Gedye*).

Stenoplatypus mordax Samps. Gold Coast, Prov. Adeiso, Feb. 1926 (*G. S. Cotterell*).

Platypus hintzi Schauf. Sierra Leone, Njala, under bark of dead rubber, 4. i. 1933 (*E. Hargreaves*); same locality, ex palm trunk, Dec. 1926 (*E. Hargreaves*); near Dilling, Sudan, 8. xii. 1926; Tanganyika Ty., Shinyanga, at light, Dec. 1934 (*E. Burtt*); Homa, South Kavirondo, Nov., Dec. 1934 (*H. J. A. Turner*); Kenya C., near Seme, Dec. 1933 (*Turner*); Makindu, April 1937 (*MacArthur*); Kisumu, Kenya, March 1936 (*Turner*).

Platypus solutus Schedl. Kaimosi, March–April 1932 (*Turner*); Nairobi (*Dr. van Someren*); N. Rhodesia, Watershed, 1928 (*Evans*); Belgian Congo, 18 miles S. W. Elisabethville (*Evans*); near Seme, Dec. 1933 (*Turner*).

Platypus schaufussi Strohm. Jinja, July 1931 (*van Someren*).

Cylindropalpus auricomans Schauf. N. Rhodesia (*Evans*); Belgian Congo, 1927 (*Dr. H. S. Evans*).

Periomatus mkusii Strohm. Near Seme, Dec. 1933 (*Turner*).

Periomatus camerunus Strohm. N. Rhodesia, Congo-Zambesi Watershed, 1928 (*Dr. H. S. Evans*); Angola, Lobito, March 1934 (*K. Jordan*).

Periomatus excisus Strohm. Angola, Congulu, April 1934 (*K. Jordan*).

Diapus 5-*spinatus* Chap. Belgian Congo, 18 miles S.W. Elisabethville; N. Rhodesia, Shigariatombwes, 4. viii. 1913 (*H. C. Dollman*).

DESCRIPTIONS OF NEW SPECIES.

Xyloctonus niger, sp. n.

Black, 2·3 mm. long, not quite twice as long as wide. From *X. scolytoides* Eichh., easily distinguished by the stouter shape, the colour and the narrow elytral sulci.

Front small and narrow, convex, finely and densely punctured, interspaces shining. Eyes bipartite, articulation of the antennæ between the lower half of the latter and the mandibles. *Pronotum* much wider than long (65 : 46), globose, widest behind the middle, posterolateral angles rounded, outline broadly semicircularly arcuate, apex somewhat narrowly rounded, and armed with two large and closely placed asperities; summit behind the middle, anteriorly covered by remotely placed small asperities which become fine transverse ridges towards the summit, interspaces finely and very densely punctured, posterior area and the greatest part of the sides very densely punctured, the punctures touching each other. Scutellum deeply impressed. *Elytra* but little wider (68 : 65) and not quite twice as long as the pronotum, sides parallel up to the middle, thence obliquely narrowed, each elytron ending in a blunt angle, thus forming a triangular emargination at the suture; striate-sulcate, sulci narrow, with but a single row of closely placed punctures, interspaces strongly carinate and much wider than the sulci.

Types in the collection of the British Museum and in my own.

Locality: Uganda, Entebbe, 11. ii. 1938 (*P. Chandler*), boring in branches of undet. tree.

Hypothenemus cassavaensis, sp. n.

Yellow, 1·37 mm. long, 2·2 times as long as wide. Among the small species of the genus this species is well characterized by the closely and regularly punctured elytra.

Front convex, minutely punctulate, finely punctured. *Pronotum* wider than long (30 : 22), widest at the base, sides arcuate, in a semicircular line, apex narrowly rounded, anterior constriction hardly visible, anterior margin with six minute and slender asperities, sometimes an additional one on the sides, summit at the middle, transversely depressed behind, anterior area with the asperities remote and moderate in size, not arranged to form concentric ridges, posterior area densely granulate-punctate. Scutellum punctiform. *Elytra* feebly wider (33 : 30) and more than twice as long as the pronotum, cylindrical, sides parallel on the basal half, thence gradually narrowed and narrowly rounded at the apex, declivity commencing somewhat behind the middle, evenly convex; disc coarsely striate-punctate, the punctures distinctly larger than interspaces between them, the striæ very feebly impressed, interstices narrow, hardly wider than the striæ, minutely punctulate and apparently with a row of fine punctures from which arise pale erect somewhat spatulate hairs.

Types in the collection of the British Museum and in my own.

Locality: Uganda, Kampala, 17. viii. 1933 (*H. Hargreaves*), in dead Cassava stem.

TRAGLOSTUS, gen. nov.

Head concealed above by the prothorax, eyes short oval, without anterior emargination. *Antennæ* inserted between the eyes and the mandibles, the scape stout, bulbiform and with several long fimbriate hairs, the funicle 6-jointed, the pedicle rather unusual, very long and slender, the other joints decreasing in length and feebly increasing in width towards the club, the latter solid, without indications of sutures but densely covered by short hairs and sensitive pores. *Pronotum* transverse, semiglobose, with no side margins, with distinct summit and posterior depression. *Elytra* cylindrical, humeral angles rounded, declivity convex. Anterior coxæ widely separated, anterior tibiæ perfectly parallel and without larger serrations or teeth on the outer margin but with the usual apical spur, third tarsal segment simple.

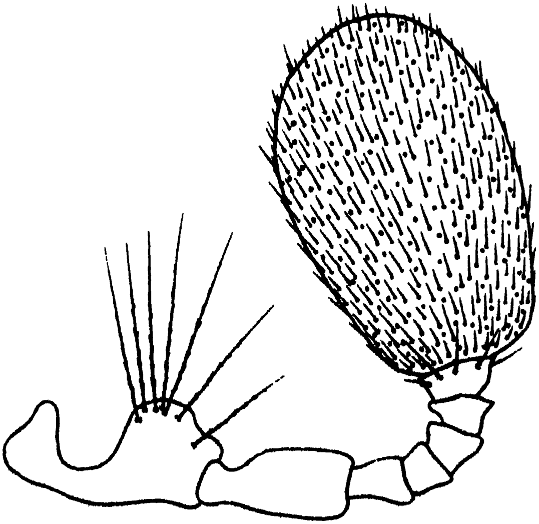
The genus appears to be related to the Cryphalinæ, and resembles in some respects certain species of the genus *Dacryphalus* Hopk.

Traglostus exornatus, sp. n.

Piceous, summit of the pronotum fuscous, 2·1 mm. long, 2·1 times as long as wide.

Front subopaque, convex above, transversely depressed below, minutely punctulate and coarsely punctured, less so towards the epistomal margin. *Pronotum* wider than long (40 : 34), widest at the basal third, base shallowly bisinuate, postero-lateral angles rectangular and feebly rounded, sides and apex nearly conjointly rounded, an anterior constriction hardly noticeable, apex with four low, closely placed and blunt serrations, summit high and in the middle, anterior area steeply convex, densely covered by low and blunt asperities, which are nowhere connected at their bases to form concentric ridges and of similar size on the greatest part of the surface; posterior area very densely and rather coarsely punctured. *Elytra* wider (52 : 48) and twice as long as the pronotum, sides parallel, broadly rounded at the apex, declivity commencing distinctly behind the middle, obliquely convex; disc extremely densely punctured, without visible striæ but the punctures arranged in approximate rows, the interstices indicated by widely separated rows of fine pale yellowish and slender scale-like hairs, on each side of them with more irregularly placed minute inclined scales; at the commencement of the declivity with a slender horizontal spine on the suture, with a shallow depression below which gradually flattens out towards the apex, the convexity with the punctures replaced by small granules.

Fig. 1.



Antennæ of *Traglostus exornatus*, sp. n.

The entire beetle shows a very rough sculpture.

Types in the collection of the British Museum and in my own.

Locality: Kenya Colony, Londiani, May 1936 (*J. A. Turner*).

Thamnurgus senecionis, sp. n.

Female.—Piceous, subopaque, with rather dense erect and fuscous pubescence, 2·5 mm. long, 2·5 times as long as wide.

Front shining, plano-convex, with a distinct transverse depression below, a medially situated triangular space impunctate, remaining surface densely and rather coarsely punctured. *Pronotum* as long as wide, base arcuate, postero-lateral angles obtuse, sides broadly arcuate, apex moderately narrowly rounded; feebly convex, densely granulate-punctate, interspaces opaque, median line impunctate on its greater part. Scutellum very small, punctiform. *Elytra* distinctly wider and twice as long as the pronotum, sides subparallel on more than the basal half, broadly rounded behind, declivity commencing behind the middle, gradually declivous; disc coarsely linate-punctate, the interspaces subshining and also with a row of punctures which do not differ from those in the striæ, the first striæ feebly impressed and the punctures rather irregularly placed; the declivity feebly aplanate up to the third interstice, the suture feebly raised, the punctures smaller and more irregular in arrangement.

The *male* has the front more strongly depressed below, the impunctate triangular area larger, the declivity steeper, the punctuation sparser and with a weak longitudinal impression along the second interstice.

The sculpture of the elytra compares very well with some species of the genus *Thamnurgus*, the pronotum, on the other hand, refers it in that group of the genus *Pœcilips* in which the punctures are replaced by small asperities on the greater part of its surface, for instance, *P. nepheli* Egg., *P. granulicauda* m., and *P. granulifer* m.

Types in the collection of the British Museum and in my own.

Locality: Kenya Colony, Aberdare Mts., 10–11,000 ft., Nov. 1934 (*A. F. J. Gedye*), on *Senecio*, and Kinangop, Dec. 1935 (*A. F. J. Gedye*).

Thamnurgus longipilus, sp. n.

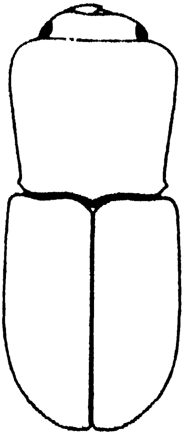
Closely allied to the foregoing species but differing in the following characters. The pubescence is much longer and more conspicuous, the elytra much more shining, the strial and interspacial punctures distinctly smaller and more remotely placed, the sexual dimorphism less pronounced The *male* has the declivity subaplanate, the suture very feebly raised, the punctures obsolete up to the third interstice, the front with a transverse shining depression and a median tubercle above. In the *female* the declivity is less aplanate, the punctures reduced in size but distinguishable, the front convex, coarsely punctured, and the median line impunctate.

Although the differences are not easy to describe, they are so striking that I do not hesitate to regard these beetles as a good new species.

Types in the collection of the British Museum and in my own.

Locality: Mt. Kilimandjaro, 15,000 ft., Dec. 1936 (*A. F. J. Gedye*).

Fig. 2.



Scolytoplatypus uter, sp. n., ♂, outline.

Scolytoplatypus uter, sp. n.

Male.—Reddish brown, a longitudinal space on the pronotum and a transverse band at the beginning of the elytral declivity dark brown to black, 3·9 mm. long, twice as long as wide (without the head). This species is easily recognized by the lack of any declivital armature.

Front concave, limited above by a sharply defined margin, cavity subopaque, minutely punctulate, densely covered by small asperate punctures, pubescence very short, yellow and inclined, median line impunctate, epistomal margin depressed in the middle. *Pronotum* wider than long (29 : 25), subquadrate, base strongly bisinuate, postero-lateral angles produced into short spine-like edges, side margin straight and strongly divergent, apex transverse, antero-lateral angles broadly rounded ; surface subopaque, minutely punctulate, densely but shallowly punctured. *Elytra* but feebly wider and 1·5 times as long as the pronotum, sides subparallel, broadly rounded behind, declivity commencing behind the middle, obliquely convex ; anteriorly feebly ascending, shining, densely punctured, the striæ and the biseriate interstices hardly distinguishable, the median third becoming opaque, horizontal, the striæ feebly impressed, the interspacial punctures less numerous but larger ; on the declivity the first interstice feebly convex and widened below, the second narrow, the third wide and convex, both following the first up to the apical margin, the other interstices meeting the third in acute angles, the fifth and seventh more strongly, the fourth and sixth feebly convex, all interstices covered with large whitish short inclined scales ; apical margin acute, with fine serrations on the sides.

Types in the collection of the British Museum and in my own.

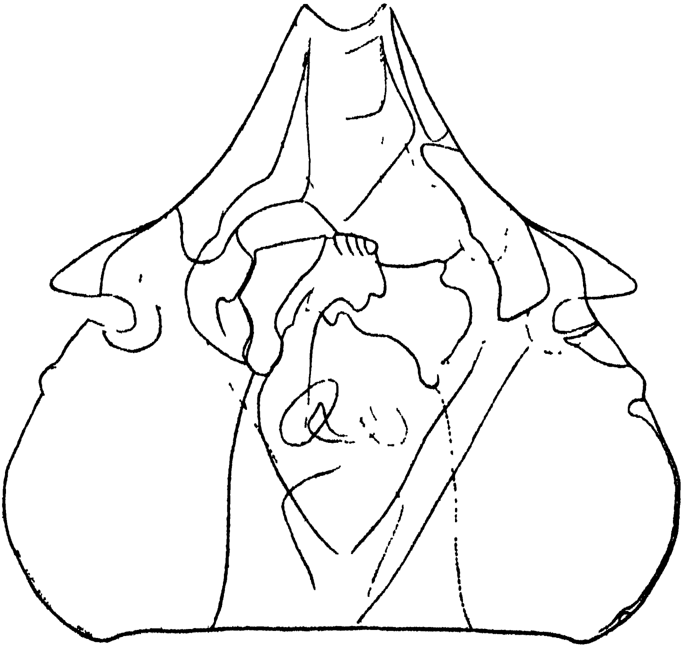
Locality : Kenya Colony, Maktaw, xii. 1936 (*MacArthur*).

LIII.—*On Two Species of Mallophaga from* Phaëthon rubricauda roseotincta (*Mathews*). By GORDON B. THOMPSON.

THE five specimens upon which these notes are based have remained unnamed in my collection for many years. As a result of my recent interest in the Mallophaga recorded from Pacific Island hosts, I have endeavoured to name them in the absence of types or authentically determined specimens. In the event of my interpretation of these two species proving to be incorrect, I hope the notes and figures given here will enable workers to decide which species I have dealt with. The host from which the specimens were obtained was taken on Lord Howe Island.

The Phaëthontidæ are an interesting group of birds from the point of view of their parasites, since the parasite evidence indicates that they are very much more closely related to the Laridæ than to the Fregatidæ, Sulidæ, etc., with which they are at present placed by the ornithologists.

Fig. 1.



Head of ***Sæmundssonia hexagonus*** (Giebel). ♀.

The following is a list of the species, together with their type-hosts, described from this family of birds :—

Phaethon aethereus mesonauta Peters.

Philopterus phaethonus (Howard), 1890 *. (*P. æthereus*, Panama.)
Menopon becki Kellogg, 1906. (*P. æthereus*, Daphne Island.)

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* Harrison (1916) gave an incorrect reference to this species and said he could not trace it.

Phaëthon æthereus subsp.

Philopterus uppalensis (Rudow), 1870. (*P. æthereus*, "Sudsee.")

Phaëthon lepturus lepturus Daudin.

Actornithophilus incisus (Piaget), 1880 (*P. flavirostris*, Madagascar.)

Phaëthon rubricauda roseocincta (Mathews).

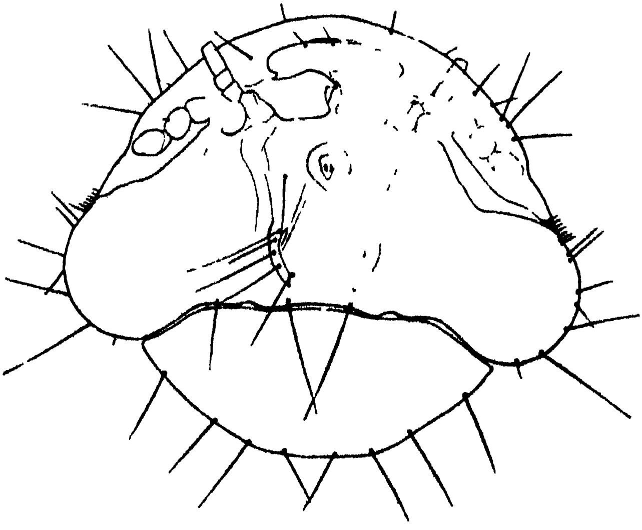
Philopterus hexagonus (Giebel), 1874 (*P. phœnicurus*.)

Menopon becki Kellogg. (Figs. 2, 3 *a*, 3 *c*.)

Trans. Amer. Ent. Soc. 1906, xxxii. p. 322.

Kellogg's description was based on a single female from *Phaëthon æthereus*, Daphne Island. Unfortunately both the specimens at hand are males, but I am assuming that they represent this species.

Fig. 2.



Head of *Menopon becki* Kellogg, ♂.

Specimens examined.—2 ♂♂ off *Phaëthon rubricauda roseotincta* (Mathews), Lord Howe Island, Blenkenthorpe.

Length 1·89 mm.; greatest breadth 0·77 mm.

A moderately sclerotic and pigmented form.

Male.—Head (see fig. 2) almost twice as broad as long; forehead convex with slight swellings at a point in line with the base of the antennæ; no slit or notch appears to be present; the antennæ are completely covered in the fossæ; ventrally the slender gular bars each bear four longish setæ; there is also a long seta just inside and near to the posterior end of each bar.

Thorax.—Prothorax almost twice as wide as long, tapering posteriorly, bearing a row of eighteen fairly long setæ widely spaced (not all shown in the figure) along the lateral margin. Mesonotum distinct, sparsely beset with long setæ. Metathorax widening to a little more than the width of the prothorax, bearing a row of about eighteen fairly long setæ along the posterior margin. Legs normal; the hind femora bears a brush of short to longish setæ (see fig. 3 *c*).

Abdomen with the tergites fairly strongly sclerotic and pigmented, separated from the paratergites or pleurites by a narrow suture; each tergite is beset with a row of fairly long setæ posteriorly; paratergites more heavily pigmented than the tergites, bearing a number of small setæ ventrally. Sternites each with a row of fairly long setæ posteriorly and numerous other smaller setæ.

Genitalia (see fig. 3 *a*).—Total length roughly two-thirds that of abdomen. Basal plate widening apically and apparently asymmetrical, parameres long, slender, and curved, widely separated, extending considerably below the preputial sac (not shown in detail in the figure) which is fairly large and beset with small "teeth." It should be noted that my drawing of the genitalia was made from a specimen *in situ*.

Sæmundssonia hexagonus (Giebel). (Figs. 1, 3 *b*.)

Insecta Epizoa, Leipzig, 1874, p. 176.

Giebel's description was based on material obtained from *Phaëthon phœnicurus*, and as I am interpreting this host-name to be the same as that from which my specimens were obtained I see no reason why this determination should not be correct.

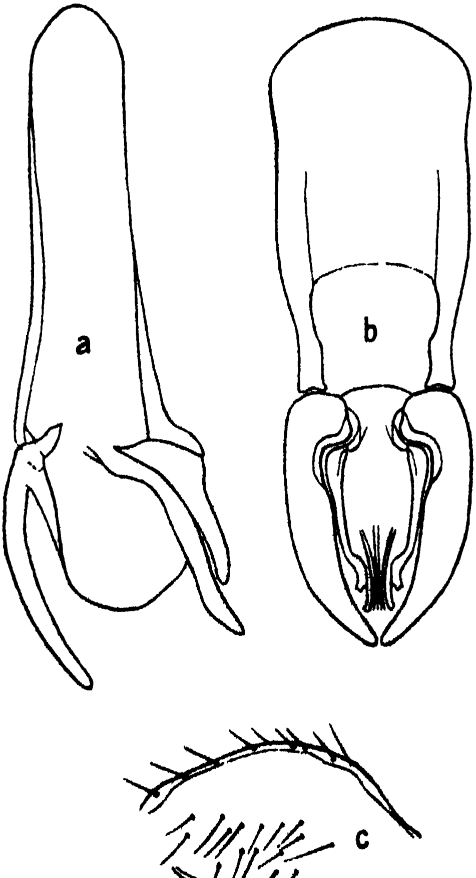
Specimens examined.—2 ♂♂, 1 ♀ off *Phaëthon rubricauda roseotincta* (Mathews), Lord Howe Island, Blenkenthorpe.

A heavily sclerotic and well-pigmented form.

Length 2·8 mm.; greatest breadth 1·12 mm.

Female.—*Head* (see fig. 1). Antennæ short with the second segment roughly equal in length to the third plus the fourth segments which are equal; the fifth segment is slightly longer than the fourth or first. Trabeculæ large, extending in length to the middle of the second antennal segment. Signature produced posteriorly to a very blunt point. Antennal bands heavily

Fig. 3.



a. Male genitalia of *Menopon becki* Kellogg. *b*. Male genitalia of *Sæmundssonia hexagonus* (Giebel). *c*. Hind femora of *Menopon becki* Kellogg.

pigmented and sclerotized. Gular plate apparently ovoid with a pair of more heavily sclerotised areas overlapping it postero-laterally.

Thorax.—Prothorax about twice as broad as long; rectangular; with a single small seta in each of the posterior lateral angles. Prothoracic skeleton very marked ventrally, the bands posterior to the first coxæ and those surrounding the coxæ heavily sclerotised. Meso-metathorax a little more than twice as broad as long, widening laterally to about half its length, then tapering to a blunt point. Ventrally the bars between the second and third coxæ are heavily sclerotised. A row of equidistantly placed small setæ along the posterior margin. Ventrally the thorax appears to be devoid of setæ.

Legs short and stout; normal as for the genus.

Abdomen slightly longer than broad with lateral margin heavily sclerotised and pigmented. Sternites and tergites apparently continuous; divided medianly except for the terminal ones; the first almost meet. Each of the first seven segments overlap the next, postero-laterally. Spiracles distinct. Four longish setæ in each postero-lateral angle; segments three to six each bear a fairly long seta on the posterior lateral margin, just inside from the spiracles. Medianly there are a few setæ on the posterior margins of the sternites. Ventrally except for a few median setæ the abdomen seems to be (almost) devoid of setæ. Eighth sternite broad and continuous, with about three short setæ about its postero-lateral angle. Ninth segment divided posteriorly. In the single specimen at hand I have been unable to make out the female genital plate on the ventral surface; it appears to occupy an area posterior to the fifth segment. It is possible that these female genital plates will furnish good specific characters in many of the species.

Male.—Generally similar to the female. The sternites are, however, separated from the tergites by a narrow suture and the tergites are continuous. The abdomen is more heavily sclerotised and pigmented.

Genitalia.—See fig. 3 *b*.

Length 2·45 mm.; greatest breadth 1·05 mm.

All the figures are drawn to the same scale.

NOTES.—In a paper which is now in the press I have expressed the opinion that the *Philopterus* spp. of Phaëthontidæ on the basis of the specimens dealt with above should be included in the genus *Sæmundssonia* along with those species occurring on Laridæ etc. The general structure of the head, the mandibles, and the male gentalia, to cite a few of the characters, seem to fall definitely within the limits of this genus.

LIV.—*New Bees of the Genera* Osmia *and* Megachile *from Cyprus* (*Hymenoptera, Apoidea*). By G. A. MAVROMOUSTAKIS, Limassol, Cyprus.

THE following paper is based on material collected by me from Cyprus, and the types of the new species are found in my collection.

Osmia limassolica Mavromoustakis.

This rare species was taken at the flowers of *Echium* and *Anchusa*, and is related to *Osmia linguaria* F. Mor., but is very distinct. Mr. V. B. Popov has kindly examined the type of *Osmia linguaria* (Zoological Institute, Leningrad), and informed me as follows :—" Tegulæ reddish-yellow ; the punctation of the supraclypeal area is very dense in the sides and sparse in the middle, and with a central space without punctures ; clypeus strongly convex, strongly and densely punctured, with a longitudinal polished line more or less large in the base and very narrow in the apex ; tongue more than 1½ longer than the body."

Osmia yermasoyiæ, sp. n. (Figs. 1–3.)

Male.—Length 9 mm.

Black ; mandibles black, bidentate, teeth brown, basal emarginate in the middle ; antennæ black ; third antennal joint longer than fourth or fifth, fourth slightly longer than fifth ; all face below antennæ with dense and long greyish-white hairs ; front with dense greyish-yellow hairs ; vertex and occiput with somewhat dense pale yellowish-brown hairs. Mesonotum shining and densely punctured ; thorax with somewhat dense short pale yellowish-brown hairs above and dense greyish-yellow hairs at sides; base of tegulæ narrowly black, rest brown; wings nearly clear; area of metathorax shining in the middle above; legs black; tarsi with the apex of small joints, fourth and fifth, yellowish brown; legs with white hairs; hind tibiæ covered with short shining white hairs above; spurs pale yellow. Abdomen densely punctured and shining; first tergite and sides of second with somewhat dense erect pale yellowish-grey hairs; apical margin of tergites 2 to 5 with entire narrow pale yellowish-grey hair-bands; tergites covered with short erect pale yellowish-grey hairs; sixth tergite with basal short lateral tooth, apical margin slightly produced and rounded at sides; seventh tergite short, as broad as the apical margin of sixth, apical margin

Fig. 1.

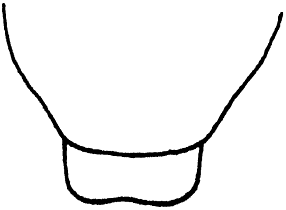


Fig. 2.

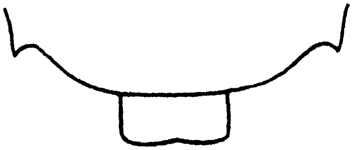


Fig. 3.

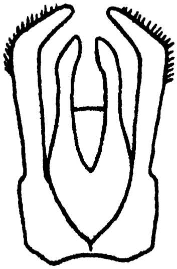


Fig. 4.

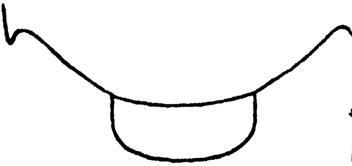


Fig. 5.

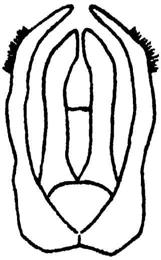


Fig. 1.—Sixth and seventh abdominal tergites of *Osmia yermasoyia*, sp. n., ♂.
Fig. 2.—Sixth and seventh abdominal tergites of *Osmia mocsaryi* Friese, ♂.
Fig. 3.—Genitalia of *Osmia yermasoyiæ*, sp. n.
Fig. 4.—Sixth and seventh abdominal tergites of *Osmia cypriaca*, sp. n., ♂.
Fig. 5.—Genitalia of *Osmia cypriaca*, sp. n.

rounded at sides and very slightly concave in the middle (fig. 1), second sternite with a somewhat thick transverse subapical slight elevation, apical margin nearly rounded; third and fourth sternites with similar elevation incised in the middle, apical margins straight; apical margin of first and second sternites with dense white hairs; apical margin of sternites 3 to 5 with dense golden hairs; the genitalia different from those of *Osmia mocsaryi* Friese.

Female.—Length 8 mm.

Mandibles tridentate; clypeus densely puntured and dull, apical margin slightly produced, straight and rounded at sides, and with transverse polished depression (slightly concave in the middle); antennæ black; all face below antennæ with somewhat long erect greyish-white hairs; front with pale greyish-white hairs; cheeks with shining white hairs; vertex and occiput with small and dense erect very pale yellowish-brown hairs. Thorax with pale yellowish-brown hairs above and shining white hairs at sides; area of metathorax shining in the middle above; last tarsal joint yellowish brown; tibiæ and outer side of basitarsi with dense shining white hairs; stigma black. First abdominal tergite with somewhat long and dense erect greyish-white hairs at sides, and very sparse and short similar hairs on the disk; tergites 2 to 5 with apical entire white hair-bands, and with very sparse and short white hairs on the disk; the bands on second and third tergites interrupted in the middle; sixth tergite very finely and densely punctured, with very short white hairs; ventral scopa greyish white.

Yermasoyia, 1 ♂ (type), 1 ♀ (allotype), 3 ♂, 2 ♀ (paratypes), 21. iii. 37, at *Chrysanthemum*. Limassol, 2 ♀ (paratypes), 13. iv. 37, nearly agree with the allotype, both, however, not first appearance; abdominal hair-bands white, pilosity on thorax, vertex, and occiput paler; 2 ♂ (paratypes), 12. iv. 38, more fresh than the type; pilosity on vertex, occiput, and thorax above yellowish brown; pilosity on the disk of abdomen and the abdominal hair-bands yellowish white; 1 ♀, 1 ♂ (paratypes), 4. iv. 38. Amathus (ruins), 1 ♂ (paratype), 13. iii. 37, 1 ♂ (paratype), 25. iii. 29.

Osmia yermasoyiæ, sp. n., is related to *Osmia mocsaryi* Friese (Ent. Nachr. xxi. pp. 133–134, 1895), but is very different. Noskiewicz, in Polsk. Pismo Ent. t. xiii. Z. 1–4, 1934, has treated in detail *Osmia mocsaryi*, and I have examined specimens determined by him, 1 ♀, 1 ♂ from Krzyweze, also 1 ♂ from Budapest (det. Enslin), and 1 ♂ from Bisamberg (det. Ducke and loaned by F. Maidl, Vienna Museum). All the above specimens of *Osmia mocsaryi* agree with the descriptions of Friese (male) and Noskiewicz (female). *Osmia yermasoyiæ* has the sixth tergite slightly broader than long, with very short tooth near the base laterally, not visible from in front; second sternite has a somewhat thick transverse subapical slight elevation, apical margin nearly rounded; abdomen with distinct hair-bands and short pilosity on the disk. *Osmia mocsaryi* has the sixth tergite sufficiently broader than long, with stout lateral tooth, visible from in front (fig 2); second sternite without subapical elevation, apical margin slightly produced and rounded in the middle; abdomen with long erect hairs not forming distinct bands. Ducke, in Ber. Natuw.-med. Ver. Innsbruck, xxv. 1900, has figured the last abdominal tergites of *Osmia mocsaryi*, but that figure is different from the real *Osmia mocsaryi*, and probably Ducke has drawn it from a different species. The genitalia of *Osmia yermasoyiae* (fig. 3) are very different from those of *Osmia mocsaryi* (Noskiewicz, in Polsk. Pismo Ent. t. xiii. Z. 1–4, t. ii. fig. 3, 1934). I have compared *Osmia yermasoyiae* with the type of *Osmia obtusa* Friese (loaned by Professor H. Bischoff, Berlin Museum) from Taurus. *Osmia obtusa* has the tergites 4 to 7 with black hairs, the basal antennal joints broad, the fulvous hairs on thorax and abdomen long and erect, not forming distinct abdominal bands. *Osmia papaveris* Latr., ♀, is larger, with sparse and fine punctation on abdomen. This species was taken at the flowers of *Achillea* and *Chrysanthemum*, and nests in the ground using *Papaver* for its cells.

Osmia cypriaca, sp. n. (Figs. 4 & 5.)

Female.—Length 10 mm.

Black; clypeus shining, densely and somewhat strongly punctured, lower margin polished, slightly projected and rounded, and with six small tubercles; mandibles tridentate, black, subapical area brown; antennæ black; vertex and occiput densely punctured and shining;

front with pale yellowish-grey hairs; clypeus, supraclypeal area, sides of face up to insertion of antennæ, with somewhat dense white hairs; cheeks with pale yellowish-grey hairs above and white beneath. Thorax dull above; punctation of mesonotum irregularly rugose (rather fine); tegulæ finely punctured, base narrowly black, rest yellowish brown; area of metathorax shining, shallowly and densely punctured at sides; thorax with short pale yellowish-brown hairs above (somewhat sparse towards the middle of mesonotum) and upper sides, and shining white hairs at lower sides. Wings nearly clear, apical margin slightly clouded; base of nervures yellowish brown, rest of nervures brown, stigma deep brown. Legs with short white hairs, dense on tibiæ above and on outer side of tarsi; last tarsal joint brown; hind basitarsi with dense and short reddish-brown hairs on inner side; spurs pale yellowish brown. Abdomen black and shining; first tergite very densely and finely punctured, with transverse subapical depression in the middle; second tergite with transverse subapical depression in the middle, the punctures above the depression dense and fine, and those below fine and very dense; tergites 3 to 5 very densely punctured; sixth tergite finely and very densely punctured, apical margin rounded; first tergite with dense yellowish-grey hairs covering the sides, the hairs forming a thin transverse subapical band; second tergite with transverse entire apical band of dense pale yellowish-grey hairs; tergites 3 to 5 with transverse somewhat broad entire apical band of dense pale yellowish-grey hairs; sixth tergite covered with very short fine yellowish-white hairs; tergites 2 to 5 with somewhat short and dense erect light yellowish-brown hairs; ventral scopa dense and white.

Male.—Length 10 mm.

Similar to the female; the hairs on head somewhat longer; mandibles bidentate, basal short and emarginate in the middle, apical longer; antennæ black; third antennal joint longer than broad, longer than second or fourth. First abdominal tergite covered with dense and somewhat long erect pale yellowish-brown hairs; tergites 2 to 6 with somewhat broad and dense entire apical transverse yellowish-white hair-bands, dense and short erect pale yellowish-brown hairs on the disk;

sixth tergite broader than long, with basal stout lateral spine, apical margin slightly elevated, broadly polished and impunctate and nearly rounded; seventh tergite short, apical margin rounded (fig. 4); second sternite slightly convex, apical margin nearly rounded; apical margin of third and fourth sternites deeply emarginate in the middle; apical margin of fifth sternite entire; sixth sternite polished and shining, broadly concave except the densely punctured basal sides, apical margin rounded; ventral segments (except the sixth) with dense greyish-white hairs; genitalia related to same of *Osmia mocsaryi* Friese (Noskiewicz, in Polsk. Pismo Ent. t. xiii. Z. 1–4, Tab. ii. fig. 3), but are very different (fig. 5).

Limassol, 1 ♀ (type), 1 ♂ (allotype), 1 ♀ (paratype), 2 ♂ (paratypes), 21. iv. 38; 3 ♀ (paratypes), 15. iv. 37; 1 ♀, 1 ♂ (paratypes), 14. iv. 38; 1 ♀ (paratype), iv. 38; 1 ♀ (paratype), v. 30. Zakaki, 1 ♀ (paratype), 18. v. 36. The type and allotype, as well as the majority of the paratypes, are very fresh specimens; the older specimens have the pilosity on the vertex, occiput and thorax above paler, the abdominal hair-bands greyish white and the short pilosity on the disk of the tergites very pale yellowish brown.

Osmia cypriaca, sp. n., is related to *Osmia grossepunctata* Kohl, ♂, but the latter has dense and very strong punctation on the head and thorax, and coarse on abdomen as in *Osmia bidentata* F. Mor., the joints of flagellum 1 to 10 shorter than broad, and the hind margins of the four basal tergites with lateral white hair-bands. I have examined the type of *Osmia grossepunctata* Kohl (kindly loaned by F. Maidl, Vienna Museum), and may add the following to the original description:—Length 6·5 mm.; clypeus minutely and very densely punctured; abdominal tergites 1 to 5 without pilosity on the disk; tergites 1 to 3 with lateral white hair-bands; fourth tergite with entire apical white hair-band; apical margin of sixth tergite brown; seventh tergite brown; second sternite without elevation, with the apical margin rounded and with a very small point in the middle.

I have compared *Osmia cypriaca* with a paratype of *Osmia wadicola* Alfken, ♀, from Palestine (received by Enslin). *Osmia wadicola* has the clypeus as in *Osmia* *cristata* Gerst., the nervures and stigma of wings yellowish brown.

Osmia cypriaca, sp. n., was taken at the flowers of *Centaurea hyalolepis* Boiss., and nests in the ground.

Megachile (Chalicodoma) cypricola, sp. n.

Female.—Length 12·5 mm.

Head black; clypeus shining, strongly and densely punctured, lower margin with small tubercles; mandibles reddish brown, apical tooth black-brown; scape and base of second antennal joint reddish brown, rest of flagellum black, with brown suffusion behind (except the last joints); all head with dense red hairs. Thorax black; mesonotum strongly and densely punctured; scutellum densely punctured; tegulæ reddish brown shining; anterior wings from base to middle yellowish brown, with the nervures and stigma reddish brown, rest clouded and with the nervures black-brown; thorax covered with dense red hairs; hind basitarsi with dense and short reddish-brown hairs on inner side; apex of claws black-brown. Abdomen shining; tergites 1 to 3 pale reddish brown; first and second tergites densely punctured, with dense and somewhat short red hairs; the hairs on second tergite forming a broad entire apical band; tergites 4 to 6 black; third tergite from base to middle with short red hairs not covering the disk; rest of third tergite and tergites 4 to 6 densely covered with short red and somewhat thick pubescence intermixed with erect red hairs; apex of sixth tergite entire and with very short black pubescence; sixth sternite without distinct zone, very sparsely punctured, base sparsely punctured, apical margin nearly entire; ventral scopa short and red and intermixed with some very short black hairs on sixth tergite in the apex.

Male.—Length 12–12·5 mm.

Black; antennæ and mandibles black; all head densely covered with long white hairs, vertex and occiput with dense pale greyish white. Thorax dense pale greyish-white hairs; base of small tarsal joints 2 to 4 and fifth reddish brown; hind basitarsi nearly parallel-sided, with short and dense yellowish-brown hairs on inner side. Abdomen black; tergites 1 to 3 with dense somewhat long pale greyish-white hairs intermixed with shorter black-brown ones, apical margin with entire thin pale greyish-white hair-band; fourth tergite with short pale greyish-white hairs intermixed with shorter black-brown, apical margin with entire thin greyish-white hair-band; fifth tergite with short black-brown hairs and a row of pale greyish-white ones in the apex; sixth tergite with short black hairs and an apical rounded depression in the middle, apical margin with 8–10 irregular short denticles and without emargination in the middle; seventh tergite hidden below the sixth, short and oval; apical margin of fourth sternite emarginate in the middle; sternites 1 to 4 with pale greyish-white hairs.

Ayia Phyla, 1 ♀ (type), 23. iii. 38; 1 ♂ (allotype), 2 ♀, 1 ♂ (paratypes), 24. iii. 35; 2 ♀ (paratypes), 19. iii. 36; 2 ♀, 2 ♂ (paratypes), 20. iii. 38; 1 ♂ (paratype), 23. iii. 38. Amathus, 1 ♀ (paratype), 16. iii. 31; 1 ♂ (paratype), 10. iii. 38. Limassol, 1 ♀, 1 ♂ (paratypes), 15. iii. 36.

Megachile (*Chalicodoma*) *cypricola*, sp n., is related to *Chalicodoma desertorum* F. Moz., and differs in the colour of pilosity, the colour of the body, in the punctation and other details. Mr. V. B. Popov, Zoological Institute, Leningrad, has kindly compared for me a pair of *Megachile cypricola* with the type of *Chalicodoma desertorum*, and informed me that both are different species. The male *Megachile cypricola* has the hind basitarsi nearly parallel-sided, the legs black, the apical depression of sixth tergite shining. According to Popov the male *Chalicodoma desertorum* (type) has the hind basitarsi not parallel-sided, but base nearly ⅓ broader than apex, the legs clear red and the depression of sixth tergite dull. Teeth of the apical margin of sixth tergite of the male shorter and blunter than those of *Chalicodoma desertorum*. *Megachile* (*Chalicodoma*) *marina* Friese, from Jericho, ♀, is larger, with the colour of the body and the pilosity sufficiently different This species is oligotropic on the flowers of *Onobrychis venosa* Desv., and the nest consists from two cells and is placed on large stones.

Osmia neoregæna, sp. n.

Female.—Length 12–12·5 mm.

Related to *Osmia cornuta* Latr., head dark blue-green; clypeus black and smooth, lower margin with a blunt and small tubercle in the middle; clypeus with a projected somewhat thick entire horn on each side, without branches and bluntly pointed in the apex, bent on inner side and beneath; mandibles large and black; antennæ black; upper part of clypeus, very narrowly base of supraclypeal area, sides of face not reaching level insertion of antennæ, with black hairs; rest of supraclypeal area and between antennæ with dense and long pale brownish-grey hairs intermixed with black ones; vertex and occiput with long black hairs intermixed with some pale yellowish grey; cheeks with black hairs on inner side and pale yellowish-grey hairs on outer side. Thorax bluish green; mesonotum dull and punctured; thorax densely covered with long dull grey hairs intermixed with black hairs above, and long dull brownish-grey intermixed with black hairs at sides; thorax with dull brownish-grey hairs beneath; tegulæ black-brown; wings nearly clear, upper half of marginal cell clouded, apical margin slightly clouded; a cloud in front of cubital cell; nervures and stigma black; legs black, apex of the last small tarsal joint and base of claws reddish brown; femora with dense and somewhat long dull brownish-grey hairs; tibiæ with some somewhat short and sparse black hairs; hind basitarsi with dense and short reddish-brown hairs on inner side; spurs reddish brown. Abdomen dark blue-green; first and second tergites finely and somewhat sparsely punctured; tergites 1 to 3 with long somewhat dense erect dull greyish-white hairs in the middle and pale yellowish-grey hairs at sides; fourth tergite with long and pale greyish-white erect hairs intermixed with sparse black; fifth and sixth tergites with somewhat long and dense erect black hairs; apical margin of sixth dorsal and ventral segment obtusely pointed in the middle; ventral scopa dense and bright reddish brown.

Male.—Length 11 mm.

Dark blue-green; antennæ long; mandibles and clypeus black; cheeks with black hairs; vertex and occiput with black hairs intermixed with sparse pale yellowish grey; front with black hairs; clypeus, supraclypeal area with long very dense pale greyish-white hairs; the hairs on supraclypeal area sparsely intermixed with black ones; the hairs on the sides of clypeus narrowly intermixed with some black. Thorax with long erect black and pale grey hairs ; the hairs on scutellum longer, thorax with black-brown hairs at sides. First and second abdominal tergites with somewhat dense and long erect pale greyish-white hairs, apical margin with somewhat short hairs ; rest with somewhat long erect black hairs ; apical margin of sixth tergite rounded ; seventh tergite very short and nearly rounded.

Saittas, 2500 ft., 1 ♀ (type), 1 ♂ (allotype), 7 ♂, 2 ♀ (paratypes), 10. iii. 37, at *almond* flowers. Kellaki, 1800 ft., 3 ♀, 1 ♂ (paratypes), 20. ii. 38, at *almond* flowers. Mt. Kornos, 2500 ft., 1 ♀ (paratype), 3. iii. 36. Ayios Kostantinos, 2500 ft., 2 ♀ (paratypes), 15. iii. 32. Armenian Monastery, 2000 ft., 8 ♀ (paratypes), 6. iii. 36. Limassol, 1 ♀ (paratype), 10. iii. 29, at *almond* flowers.

Osmia neoregæna, sp. n., differs from *Osmia cornuta* in the colour of the body and pilosity, the form of the horns of the clypeus, and the last abdominal tergite of the female.

LV.—*Description d'un* Meliboœus *de la faune paléarctique et de deux* Buprestidæ *exotiques*. Par A. Théry, attaché au Muséum national d'Histoire Naturelle.

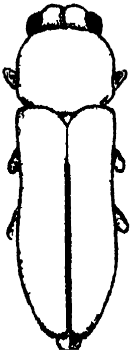
Meliboœus bodenheimeri, sp. n. (Fig. 1.)

Long. 6·6 mm. ; larg. 2 mm. Sexe indéterminé. Entièrement d'un bronzé cuivreux, en dessus, le dessous bronzé, antennes et pattes bronzés, tarses noirs ; recouvert partout d'une faible pubescence claire, couchée et distincte, celle du front soulevée et recourbée. Allongé, subcylindrique, à côtés subparallèles.

Tête très convexe et fortement sillonnée sur le front et le vertex, à sculpture formant des stries obliques sur le vertex et sublongitudinales en avant. Front plus large que haut, à côtés faiblement divergents vers le sommet. Epistome assez large, plus haut que large, largement échancré. Labre en forme de croissant. Yeux assez proéminents, moyens, assez régulièrement ovales, assez larges, occupant les 2/5 de la hauteur de la tête. Antennes très courtes, dépassant peu le bord antérieur du pronotum, dentées à partir du 5e article,

le 2e article en forme d'olive, le 3e de la longueur du 2e mais moins épais, plus long que le 4e, épaissi au bout, le 4e également épaissi à l'extrémité, les suivants très transversaux, en triangle aigu mais émoussés au sommet. Scrobe génal profond, dents génales très larges à la base, en triangle obtus. Pronotum d'un huitième plus large que long, ayant sa plus grande largeur avant la base, à côtés subparallèles, au milieu, le bord antérieur presque droit, les angles antérieurs très abaissés, aigus, les côtés légèrement sinués, vus de dessus, bordés par une carène entière prolongeant le scrobe génal en ligne droite jusqu'après le milieu, puis brusquement arquée sur sa moitié postérieure. Angles postérieurs complètement arrondis, base faiblement sinuée, avec un lobe médian sinué également. Disque très bombé, gibbeux vers le tiers postérieur, brusquement déclive sur les côtés en avant, légèrement déprimé vers les angles postérieurs avec un petit sillon le long du sommet de cet angle. Surface du disque couverte d'une réticulation formée par des rides équidistantes, concentriques autour du centre de la gibbosité. Ecusson plus long que large, subtriangulaire. Elytres de la largeur du pronotum à la base, environ deux fois 1/2 aussi longs que larges ensemble, subanguleux aux épaules, faiblement sinués latéralement sur leur moitié antérieure, faiblement élargis au tiers postérieur, puis longuement atténués en courbe jusqu'au sommet, où ils sont isolément arrondis, très

Fig. 1.



Melibaeus bodenheimeri, sp. n.

finement, mais très distinctement denticulés tout à fait à l'apex. Carène épipleurale nettement indiquée sur toute la longueur, épipleure étroit, unisérialement pubescent, lobe épipleural très étroit et légèrement sinué. Suture rebordée par un fin bourrelet limitée au sommet par une strie qui contourne l'apex. Pygidium tectiforme, arrondi, muni de chaque côté de quelques petites épines irrégulières. Episternes profondément creusés en avant pour le logement de l'antenne, le sillon atténué postérieurement. Prosternum très déclive antérieurement, son bord antérieur fortement lobé de chaque côté. Saillie assez large, rebordée par un fin bourrelet, anguleuse et aiguë au sommet, à ponctuation peu distincte et cachée par la pubescence assez longue. Tout le dessous avec la sculpture écailleuse normale dans le genre, les hanches postérieures avec l'angle latéro-postérieur redressé et arrondi au sommet, dernier sternite fortement impressionné au milieu. Le dernier article de tous les tarses aussi long que les 4 autres réunis.

Habitat: Palestine, Kiyath Onaxim (*F. S Bodenheimer*), vii. 1936, sur des feuilles de Pommier (?).

Deux exemplaires communiqués par The Imperial Institute of Entomology.

Type dans le British Museum ; un paratype se trouve dans la collection.

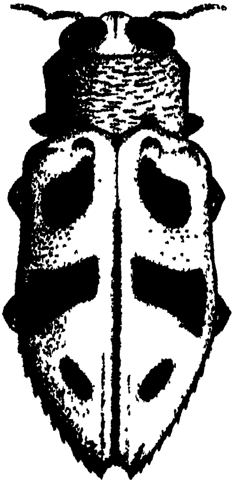
J'ai comparé cette espèce aux descriptions des autres espèces du même pays ou des régions avoisinantes et aucune ne paraît lui convenir. *M. angoranus* Obb. est plus petit et les angles du pronotum sont aigus ; *M. cryptocerus* Kiesw. a les angles du pronotum arrondis ; *M. cyprius* Zurcher est beaucoup plus petit et les angles postérieurs du pronotum sont marqués ; *M. heydeni* a ces angles presque droits ; *M. staneki* Obb. a ces angles arrondis, mais l'auteur le compare à *M. sculpticollis* Abeille, espèce absolument sans aucun rapport avec la mienne, la description de *M. staneki* est du reste des plus mauvaise et très incomplète ; enfin *M. xerophilus* Obb. a les antennes dentées à partir du 4^{e} article et non du 5^{e} comme *M. bodenheimeri* m.

Chrysobothris picklesi, sp. n. (Fig. 2.)

Long. 9·4 mm. ; larg. 4 mm. Peu allongé, large, ayant sa plus grande largeur vers le tiers postérieur, D'un vert émeraude en dessus, orné sur les élytres de trois taches sombres dont la médiane forme une fascie interrompue à la suture, ces taches paraissent noires, vues normalement, et rouges, vues obliquement ; dessous d'un vert un peu bleuâtre.

Tête bombée entre les yeux, vue de dessus, impressionnée sur le front, couverte de rides transversales très rugueuses, sans carène distincte au sommet du front. Vertex strié longitudinalement. Yeux rapprochés assez fortement au sommet, assez saillants. Antennes sans caractères particuliers. Pronotum à côtés subparallèles, très faiblement cintrés, obliquement tronqués aux angles antérieurs, faiblement échancré en avant, avec les angles postérieurs aigus et faiblement arrondis au sommet ; le lobe médian de la base, arrondi ; les côtés rebordés par une carène droite n'atteignant pas les angles antérieurs. Disque couvert de vagues rides transversales, garnies de points, les côtés assez fortement ponctués. Ecusson petit, triangulaire, lisse. Elytres ayant leur plus grande largeur après le milieu (3·8 mm. aux épaules et 4·1 mm. au milieu), un peu plus de une fois 3/4 aussi longs que larges (1 et 8/10), un peu plus de une fois 1/4 aussi larges aux épaules, que le pronotum à la base, arrondis aux épaules ; faiblement sinués de l'épaule au milieu, atténués

Fig. 2.



Chrysobothris picklesi, sp. n.

en faible courbe, ensuite, et fortement denticulés latéralement à partir du tiers postérieur, isolément acuminés à l'apex et terminés par une forte épine, laissant un vide sutural anguleux, avec une petite épine suturale, accompagnée de quelques très petits denticules entre l'épine suturale et l'apicale. Disque légèrement évidé en arrière, le long de la suture, avec une profonde fossette sur le lobe basal et une autre plus faible derrière l'épaule, l'épine apicale surmontée d'une petite carène. Prosternum fortement rebordé en avant, à bord antérieur droit, sillonné le long du bord, la saillie rugueuse, large, dilatée derrière les hanches et terminée en pointe. Premier sternite abdominal concave ; abdomen brillant, couvert de rides longitudinales peu accentuées, dernier sternite bisinueux au sommet, entre trois dents égales et peu saillantes. Fémurs antérieurs armés d'une large dent obtuse, dont le bord externe est très finement denticulé. Tibias antérieurs à peine arqués.

Habitat : Carriacou, Brit. W. Indies, Juin 1937 (*A. Pickles*).

Un seul exemplaire de sexe indéterminé communiqué par The Imperial Institute of Entomology.

Type dans le British Museum.

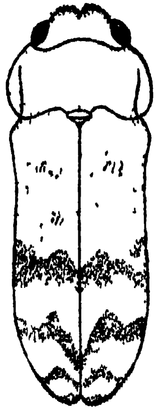
Cette espèce rappelle *C. melazona* Chev. et les espèces à dessus vert émeraude avec des bandes foncées, elle se distingue de suite par son pronotum beaucoup moins large que les élytres, etc.

Sambus simmondsi, sp. n. (Fig. 3.)

Long. 4 mm. D'un bronzé noirâtre, brillant, les élytres ornés de dessins irréguliers sur la moitié antérieure et de fascies transverses sur la moitié postérieure, ces dessins formés d'une pubescence dorée mélée de poils gris. Dessous d'un noir bronzé, faiblement pubescent.

Tête assez grosse, le vertex faisant saillie en avant des yeux, divisé en deux par un profond sillon et paraissant bilobé ; front inégal, couvert d'une pubescence laineuse, blanche, disposée en rosace. Epistome ayant la forme d'un parallélogramme, séparé du front par une carène, impressionné sur toute sa surface. Front un peu plus large que haut, à côtés parallèles. Yeux gros, assez saillants. Antennes courtes, épaisses, compactes, larges, n'atteignant pas le milieu de la longueur du pronotum. Pronotum transversal, beaucoup plus large que haut, régulièrement arrondi sur les côtés, avec les angles postérieurs complètement arrondis, la base assez profondément bisinuée avec un lobe médian tronqué. Disque granuleux, à pubescence peu serrée, déprimé sur les côtés, largement sillonné transversalement en arrière, avec une carinule angulaire partant des angles postérieurs, presque droite et atteignant les trois quarts de la longueur. Elytres arrondis aux épaules, sinués latéralement de l'épaule au milieu, puis atténués en courbe jusqu'au sommet où ils sont isolément et un peu irrégulièrement arrondis et très faiblement denticulés. Disque brillant, fortement rugueux et à sculpture peu distincte, orné de trois fascies sur la moitié postérieure, assez bien dessinées, avec l'apex pubescent. Dernier sternite entouré d'un sillon en forme de coulisse, recourbé vers l'intérieur, avant les angles postérieurs. Cuisses postérieurs simplement renflées, sans dent, tibias postérieurs sans caractères spéciaux.

Fig 3



Sambus simmondsi, sp n.

Habitat: Tamanua, I. Fidji (*H. W. Simmonds*).

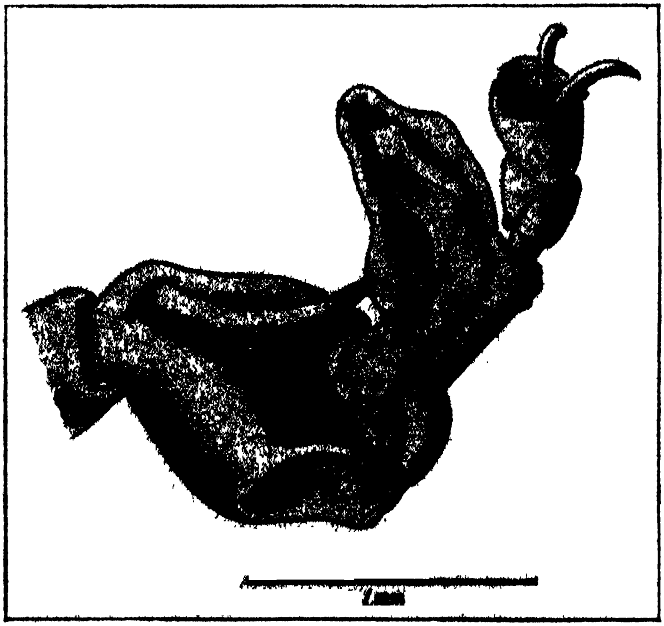
Description faite sur un exemplaire communiqué par The Imperial Institute of Entomology.

Type dans le British Museum.

Cette espèce est je crois la plus petite actuellement décrite de Polynésie. J'ai eu quelques difficultés à la dessiner, l'exemplaire étant mort dans la position du vol, c'est à dire ailes et élytres déployées.

LVI.—*On a Second Specimen of* Cryptocellus simonis *Hans. & Sør.* [*Arachnida*]. By R. J. Whittick, B.Sc., Department of Zoology, British Museum (Natural History).

Just over a century ago Guérin-Méněville published his description of *Cryptostemma westermanni*, the first species of the order Ricinulei, basing it on a specimen from West Africa. The next specimen referred to this order was found by Bates on his voyage in the Amazon basin and was placed in a new genus, *Cryptocellus*, by Westwood, who described it in 1874. Since that time Ricinulei in general have been very uncommon in collections (*cf.* Finnegan, 1935), and the rarity of the South American genus in particular will be seen from the following table, in which the known species of *Cryptocellus* are listed, together



Cryptocellus simonis ♂.
Leg iii, antero-dorsal view of tarsal joints.

with their distribution and the numbers of individuals recorded :—

1. *C. fœdus* Westwood, 1874............	1 ♀	Brazil.
2. *C. simonis* Hansen & Sørensen, 1904 ..	1 ♂	Brazil.
3. *C. centralis* Fage, 1921	1 ♂	Costa Rica.
4. *C. magnus* Ewing, 1929	1 ♀	Colombia.
5. *C. manni* Ewing, 1929	1 ♀	Colombia.
6. *C. emarginatus* Ewing, 1929	1 ? ♀	Costa Rica.
7. *C. barberi* Ewing, 1929	7 ♀ & juv.	Guatemala & Honduras.

Only one species was represented by more than a single specimen, and none by both sexes.

The discovery of a member of the group in a miscellaneous collection of Arachnida made by Mr. C. A. Hudson in British Guiana seems, therefore, worthy of record. The specimen is an adult male of the speces *Cryptocellus simonis*, and agrees so closely with the excellent description given by the authors, Hansen and Sørensen (1904), that little comment is necessary. Since, however, the original illustrations are small, a figure of the tarsus of leg iii is given here on a larger scale and from a different point of view.

The dimensions (in millimetres) of the British Museum specimen are as follows :—

Body-length 6·2.
Prosoma : length 2·5 ; width 2·2.
Opisthosoma : length 3·6 ; width 2·8.
Cucullus 1·3 × ·9.
Palpi : length 3·4.
Length of legs : i = 5·0, ii = 9·0, iii = 6·7, iv = 6·0.

The single specimen was found in the New River District of British Guiana at an altitude of 750 feet, and extends considerably the known range of the species.

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LVII.—*The Lice of Petrels.*—Part I. *The elongate Forms.* By GORDON B. THOMPSON.

FABRICIUS described the first species of Mallophaga from a Procellariiform in 1775, and since his time a large number of other species have been described by the well-known workers on the Mallophaga, namely, Rudow, Giebel, Piaget, Taschenberg, and Kellogg. Considering the Procellariiformes as a group of birds, a fairly considerable number of the elongate forms of Mallophaga have been described from them and may still be regarded as valid species. This is in all probability due to the fact that the elongate forms occurring on these birds do not readily leave their hosts on the death of the latter, but die on their host firmly attached to portions of the feathers, thus providing a good supply of specimens to those who are in a position to examine their hosts' skins in museum collections. An additional source of supply of these lice has been from among the material collected by Arctic and Antarctic expeditions, since the particular birds in question are abundant in these regions.

In a series of papers of which this contribution may be regarded as the first part I am hoping to present a list of the species described to date, together with some general notes and figures of the species comprising the group, keys to the genera and species, etc., etc.

It is a well-known fact now that the late Professor L. Harrison, for whose work I have the utmost admiration, was keenly interested in the group of Mallophaga with which I intend to deal. Unfortunately, owing to a misunderstanding some descriptions of genera etc. were published by me a year or two ago which recently appeared in a similar form in a posthumous work of the late Professor L. Harrison. It is not my intention to excuse myself of this breach of scientific etiquette, but at the same time I do wish it to be known that I had no intention of "pirating" Harrison's work, and shall always refer in future to these genera as being those of Harrison.

A LIST OF THE MALLOPHAGA (*ESTHIOPTERINÆ*) OF PROCELLARIIFORMES DESCRIBED TO DATE.

In the following list the species of Mallophaga are arranged in alphabetical order; all the references have been checked against the originals, and the abbreviations are in accordance with the 'World List of Scientific Periodicals' (1934). The host names have all been brought up to date in accordance with Peters' 'Check-List of Birds of the World,' vol. i. 1931. For the English names and for much assistance in the correction of the older host names I have made good use of Mathews' 'Check-List of the Order Procellariiformes' (1934). Following my usual practice I have in every case given the original host names as given by the author of the parasite, together with the locality where stated, so that in the event of my interpretation of a host name being incorrect it can be easily rectified. Immediately below each of the species of Mallophaga listed I have given a preliminary note on its present systematic position. These opinions will probably have to be modified when some of the older types have been examined.

1. *abnormis* (*Lipeurus*) Piaget (1885).

Les Pédiculines, Suppl., Leiden, pp. 65–66, pl. vii. f. 2.

Type-host: *Puffinus gravis* (O'Reilly) (*Puffinis major*—Rotterdam Zoo) [Great Shearwater].

Present status: *Halipeurus abnormis* (Piaget).

2. *angulicollis* (*Nirmus*) Giebel (1876).

Ann. & Mag. Nat. Hist. xvii. p. 388.

Type-host: *Diomedea exulans* Linné (*Diomedea exulans*) [Wandering Albatross].

Present status: synonym of *Episbates pederiformis* (Dufour).

3. *angusticeps* (*Lipeurus*) Piaget (1880).

Les Pédiculines, Leiden, pp. 306–308, pl. xxv. f. 4.

Type-host: *Adamastor cinereus* (Gmelin) (*Procellaria cinerea*—Leiden Museum) [Pediunker or Grey Shearwater].

Present status: *Halipeurus angusticeps* (Piaget).

4. *annuliventris* (*Lipeurus*) Uchida (1917).

Annot. Zool. Jap. ix. pp. 204–206, f. 2.

Type-host: *Oceanodroma furcata* (Gmelin) (*Oceanodroma furcata*—Japanese waters) [Fork-tail Petrel].

Present status: *Philoceanus annuliventris* (Uchida).

5. *antarcticus* (*Pseudonirmus*) Harrison (1937).

Australasian Antarctic Expedition, 1911–14. ser. C, vol. ii. pt. 1, pp. 26–27, f. 26.

Type-host : *Thalassoica antarctica* (Gmelin) (Adelie Land).

Present status : *Pseudonirmus antarcticus* Harrison.

6. *becki* (*Philoceanus*) Kellogg (1903).

Biol. Bull. Wood's Hole, v. pp. 88 89, f. 1, 2.

Type-host : *Oceanodroma tethys tethys* (Bonaparte) (*Procellaria tethys*—Galapagos Is.) [Galapagos White-rumped Storm Petrel].

Present status : *Philoceanus becki* Kellogg.

7. *bilineatus* (*Lipeurus*) Stephens (1829).

A Systematic Catalogue of British Insects, London, p. 333.

Type-host : no host given.

Present status : a *nom. nud.*, in all probability the species later described by Giebel as *nigrolimbatus*.

8 *breviceps* (*Lipeurus*) Piaget (1890).

Tijdschr. Ent. xxxiii. pp. 243–244, pl. ix. f. 6.

Type-host : *Diomedea exulans* Linné. (Rotterdam Zoo.)

Present status : a synonym of *E. pederiformis* (Dufour).

9. *caudatus* (*Lipeurus*) Rudow (1869).

Beiträg zur Kenntniss der Mallophagen oder Pelzfresser, Diss., Halle, p. 31.

Type-host : *Priocella antarctica* (Stephens) (*Procellaria glacialoides*—South Seas) [Silver-grey Petrel].

Present status : it is almost impossible to recognize this species, and it may have to be discarded.

10. *celer* (*Lipeurus*) Kellogg (1896).

Proc. Calif. Acad. Sci. ser. 2. vi. pp. 117–119, pl. vii. f. 5, 6.

Type-host : *Fulmarus glacialis rodgersi* Cassin (*Fulmarus glacialis* vars. *glupischa* and *rodgersi*—Bay of Monterey, California) [Glupisch or Pacific Fulmar].

Present status : synonym of *P. nigrolimbatus* (Giebel).

11. *charcoti* (*Degeeriella*) Neumann (1907).

Expédition Antarctique Française (1903–1905), pp. 15–16, figs.

Type-host : *Pagodroma nivea* (Forster) (*Pogodroma nivea* Lath.) [Small-billed Snowy Petrel].

Present status : *Pseudonirmus charcoti* (Neumann).

12. *clypeatus* (*Lipeurus*) Giebel (1874).

Insecta Epizoa, Leipzig, pp. 236–237.

Type-host: *Halobæna cærulea* (Gmelin) (*Pachyptila cœrulescens*) [Blue Petrel].

Present status: *Naubates clypeatus* (Giebel).

13. *concinnus* (*Lipeurus*) Kellogg & Chapman (1899).

Occ. Pap. Calif. Acad. Sci. vi. pp. 97–99, pl. vii. f. 2.

Type-host: *Diomedea albatrus* Pallas (*Diomedea albatrus*—Bay of Monterey, California) [Short-tailed Albatross].

Present status: *Perineus concinnus* (Kellogg & Chapman).

14. *confidens* (*Lipeurus*) Kellogg (1899).

Occ. Pap Calif. Acad Sci. vi. pp. 26–28, pl. iii. f. 1.

Type-host: *Diomedea nigripes* Audubon (*Diomedea nigripes*—North Pacific Ocean) [Black-footed Albatross].

Present status: *Perineus confidens* (Kellogg).

15. *constrictiventre* (*Esthiopterum*) Pessôa & Guimarães (1935).

Ann. Fac. Med. S. Paulo, fasc. iii. xi. pp. 5–6, f. 6, 7

Type-host: *Pterodroma macroptera macroptera* (A. Smith) (*Æstrelata macroptera* Smith—Brazil) [Grey-faced or Great-winged Petrel].

Present status: doubtful, until type is examined.

16. *densus* (*Lipeurus*) Kellogg (1896).

Proc. Calif. Acad. Sci. ser. 2, vi. pp. 114–115, pl. vii. f. 1, 2.

Type-host: *Diomedea albatrus* Pallas (Bay of Monterey, California).

Present status: immature form—synonym of *H. diomedeæ* (Fabricius).

17. *diomedeæ* (*Pediculus*) Fabricius (1775).

Systema Entomologiæ, Flensburg, p. 808.

Type-host: *Diomedea exulans* Linné ("Brasiliæ diomedeis").

Present status: *Harrisoniella diomedeæ* (Fabricius).

18. *diversus* (*Lipeurus*) Kellogg (1896).

Proc. Calif. Acad. Sci. ser. 2, vi. pp. 123–124, pl. viii. f. 3, 4.

Type-host : *Puffinus opisthomelas* Coues (Bay of Monterey, California) [Black-vented Manx Shearwater].

Present status : *Halipeurus diversus* (Kellogg).

19. *diversus excavatus* (*Lipeurus*) Johnston & Harrison (1912).

Trans. N.Z. Inst. xliv. p. 366, f. 2.

Type-host : *Pterodroma phillipii* (G. R. Gray) * (*Œstrelata neglecta* Schlegel—Sunday I.).

Present status : *Halipeurus kermadecense* (Johnston & Harrison).

20. *diversus major* (*Lipeurus*) Kellogg & Kuwana (1902).

Proc. Wash. Acad. Sci. iv. p. 477.

Type-host : *Puffinus lherminieri subalaris* Ridgway (*Puffinus subalaris*—Albemarle I.).

Present status : *Halipeurus* sp. ?

21. *eatoni* (*Lipeurus*) Kellogg (1914).

Sci. Bull. Brooklyn Inst. ii. pp. 86–87.

Type-host † : *Pelecanoides urinatrix berard* (Gaimard) (*Pelecanoides urinatrix*—S. Georgia Is.) [Diving Petrel].

Present status : synonym of *Pelmatocerandra setosa* (Giebel).

22. *elongatus* (*Lipeurus*) Müller (1927).

Ber. westpreuss. bot. Zool. Ver. xlix. pp. 1–2.

Type-host : *Diomedea exulans* Linné.

Present status : synonym of *E. pederiformis* (Dufour).

Note.—Müller's name is a *nom. nov.* for *breviceps* Piaget (1890), nec 1888.

23. *exiguus* (*Lipeurus*) Kellogg & Kuwana (1902).

Proc. Wash. Acad. Sci. iv. p. 479, pl. xxx. f. 2.

Type-host ‡ : *Oceanites gracilis galapagoensis* Lowe (*Oceanites gracilis*—Albemarle I.).

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* Peters (1931) places *neglecta* Schlegel as a synonym of *phillipii* (Gray), whereas Mathews (1934) regards the two as distinct.

† Kellogg's specimens were obtained from this host and *Oceanodroma l. leucorhoa* Vieillot [Leach's Fork-tail Petrel] (N. Tropical Atlantic), but I do not think the latter is a true host of this parasite.

‡ Kellogg and Kuwana also obtained specimens from *Geospiza fuliginosa* Gould, but these were obvious stragglers.

Present status: immature form—synonym of *Synnautes pelagicus* (Denny).

24. *ferox* (*Lipeurus*) Giebel (1867).

Z. ges. Naturw. xxix. pp. 195–196.

Type-host: *Diomedea melanophris melanophris* Temminck (*Diomedea melanophrys*) [Black-browed Mollymawk].

Present status: synonym of *H. diomedeæ* (Fabricius).

25. *ferreirai* (*Esthiopterum*) de Barros Netto (1933).

Contribuicão ao Estudo do Genero *Esthiopterum* (Hexapoda, Mallophaga), Thesis, Faculty of Medicine, S. Paulo, pp. 33–38, 3 pls.

Type-host: *Diomedea melanophris melanophris* Temminck (*Diomedea melanophrys*).

Present status: doubtful, until type is examined.

26. *fuliginosus* (*Lipeurus*) Taschenberg (1882).

Nova Acta Leop. Carol. xliv. pp. 156–157, pl. iv. f. 3.

Type-hosts: *Diomedea exulans* Linné and *Diomedea chlororhynchos* Gmelin.

Present status: *Naubates fuliginosus* (Taschenberg).

27. *fuliginosus major* (*Lipeurus*) Kellogg & Chapman (1899).

Occ. Pap. Calif. Acad. Sci. vi. p. 101, pl. viii. f. 3.

Type-host: *Puffinus opisthomelas* Coues and *Puffinus creatopus* Coues—Bay of Monterey, California.

Present status: probably a synonym of *Naubates fuliginosus* (Taschenberg).

28. *gaini* (*Lipeurus*) Neumann (1913).

Deuxième Expédition Antarctique Française (1908–1910), pp. 192–195, f. 4, 5.

Type-host: *Macronectes giganteus* (Gmelin) (*Ossifraga gigantea*—Petermann I.) [Giant Fulmar].

Present status: synonym of *Perineus obscurus* (Rudow).

29. *garbei* (*Naubates* (*Micronaubates*)) [Pessôa & Guimarães (1935).

Rev. Biol. Hyg., S. Paulo, vi. pp. 109–112, f. 8–11.

Type-host: undetermined (Brazil).

Present status: *Naubates garbei* Pessôa & Guimarães.

30. *giganticola* (*Nirmus*) Kellogg (1896).

Proc. Calif. Acad. Sci. ser. 2, vi. pp. 105–107, pl. v. f. 6.

Type-host : *Diomedea albatrus* Pallas (Bay of Monterey, California).

Present status : *Perineus giganticola* (Kellogg).

31. *grandis* (*Lipeurus*) Piagot (1880).

Les Pédiculines, Leiden, pp. 323–324, pl. xxvi. f. 7.

Type-host * : *Hydrobates pelagicus* (Linné) (*Thalassidroma* (*Procellaria*) *pelagica*—Rotterdam Zoo) [Storm Petrel].

Present status : synonym of *Perineus modestus* (Giebel).

32. *gurlti* (*Lipeurus*) Taschenberg (1882).

Nova Acta Leop. Carol. xliv. pp. 151–153, pl. v. f. 6, 6 *a*.

Type-host † : *Daption capensis* (Linné) (*Procellaria capensis*) [Pintado or Cape Pigeon], and *Priocella antarctica* (Stephens) (*Procellaria glacialoides* (=*smithi*)) [Silver-grey Petrel].

Present status : *Pseudonirmus gurlti* (Taschenberg).

Note.—Harrison (1916, pp. 135, 137) placed *gurlti* Taschenberg as a synonym of *lineare* Nitzsch, but this is an obvious error—Taschenberg's species should have been printed in bold type, not italics, and the reference to Nitzsch's species should be omitted.

33. *harrisoni* (*Naubates*) Bedford (1930).

16th Rept. Vet. Res. S. Afr. p. 168, f. 12, 14, 16 *b*.

Type-host : *Puffinus gravis* (O'Reilly) (*Ardenna gravis*—Capetown, C.P.) [Great Shearwater].

Present status : *Naubates harrisoni* Bedford.

34. *heteroproctus* (*Naubates*) Harrison (1937).

Australian Antarctic Expedition, 1911–14, ser. C, vol. ii. pt. 1, p. 30, pl. 2, f. 4, 5, 6, 7.

Type-host : *Pterodroma lessonii* (Garnot) (*Æstrelata lessoni*—Macquarie I.).

Present status : *Naubates heteroproctus* Harrison.

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* This is not the true host of this parasite, which seems to be characteristic of skuas.

† I am inclined to the opinion that *Daption capensis* (Linné) is the true host of this parasite.

35. *hyalinus* (*Lipeurus*) Neumann (1911).

British Antarctic Expedition (1907–9), ii. pt. iii. pp. 21–22, pl. ii. f. 1 *a* & 1 *d*.

Type-host: *Diomedea exulans* Linné (*D. exulans*—S. Indian Ocean and S. of Tasmania).

Present status: *Perineus hyalinus* (Neumann).

36. *kermadecense* (*Lipeurus*) Johnston & Harrison (1912).

Trans. N.Z. Inst. xliv. p. 365, f. 1.

Type-host: *Pterodroma phillipii* (G. R. Gray) * (*Œstrelata neglecta* Schl.—Kermadec Is.).

Present status: *Halipeurus kermadecense* Johnston and Harrison.

37. *laculatus* (*Lipeurus*) Kellogg & Chapman (1899).

Occ. Pap. Calif. Acad. Sci. vi. pp. 93–95, pl. vii. f. 1.

Type-host †: *Stercorarius pomarinus* (Temminck) (Bay of Monterey, California).

Present status: synonym of *Perineus modestus* (Giebel).

38. *læve* (*Metopeuron*) Rudow (1870).

Z. ges. Naturw. xxxvi. pp. 140–141.

Type-host: *Diomedea* sp. ? *exulans* Linné (*Diomedea* sp.—South Seas).

Present status: almost certainly a synonym of *Episbates pederiformis* (Dufour).

39. *languidus* (*Lipeurus*) Kellogg & Kuwana (1902).

Proc. Wash. Acad. Sci. iv. pp. 475–476, pl. xxix. f. 8.

Type-hosts ‡: *Oceanites gracilis galapagoensis* Lowe (*Oceanites gracilis*, Albemarle I.) and *Oceanodroma tethys tethys* (Bonaparte) (*Procellaria tethys*—Albemarle I.)

Present status: synonym of *Synnautes pelagicus* (Denny).

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* See footnote under species no. 18.

† Kellogg and Chapman also had specimens from *Puffinus creatopus* Coues, but these were stragglers.

‡ Kellogg and Kuwana also recorded this species from the following hosts, but the specimens were obvious stragglers:—*Sula piscator websteri* Rothschild, *Actitis macularia* (Linné), *Pyrocephalus nanus intercedens* Ridgway, *Nesomimus p. parvulus* (Gould), *Geospiza f. fuliginosa* Gould, *Cactospiza pallida producta* (Ridgway).

40. *lepturus* (*Lipeurus*) Enderlein (1909).

Deutsche Sudpolar Expedition (1901 1903), x. Zoologie u. Band, Heft. 4, pp. 452 453, pl. lxii. f. 200-202, 209.

Type-host *: *Phœbetria palpebrata palpebrata* (Forster) (*P fuliginosa* Gm.—N.W. Prince Edward I.).

Present status: synonym of *Perineus meridionalis* (Rudow).

41. *limitatus* (*Lipeurus*) Kellogg (1896).

Proc. Calif. Acad. Sci. ser. 2, vi. pp. 124-125, pl. viii. f. 5, 6.

Type-host: *Puffinus griseus* (Gmelin) (*P. griseus*—Bay of Monterey, California) [Sombre Shearwater]

Present status: immature form—synonym of *Halipeurus diversus* (Kellogg).

42. *lugubris* (*Lipeurus*) Taschenberg (1882).

Nova Acta Leop. Carol. xliv. pp. 153 154.

Type-host †: ? *Daption capensis* (Linné).

Present status: synonym of *Pseudonirmus gurlti* (Taschenberg).

43. *macilhennyi* (*Lipeurus*) Kellogg & Kuwana (1900).

Proc. Acad. Nat. Sci. Philad. pp. 155–156, pl. vii. f. 3.

Type-host: *Diomedea nigripes* Audubon (*D. nigripes*—Alaska) [Black-footed Albatross].

Present status: synonym of *Episbates pederiformis* (Dufour).

44. *marquesanum* (*Esthiopterum*) Ferris (1932).

Bull. Bishop Mus. Honolulu, xcviii. pp. 62–63, f. 14.

Type-host: *Pterodroma rostrata rostrata* (Peale) (*P. rostrata*—Marquesas Is.).

Present status: *Halipeurus marquesanus* (Ferris).

45. *melanocnemis* (*Lipeurus*) Giebel (1874).

Insecta Epizoa, Leipzig, p. 233.

Type-host: *Macronectes giganteus* (Gmelin) (*Procellaria gigantea*).

Present status: synonym of *Perineus obscurus* (Rudow).

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* Enderlein also had specimens from *Diomedea exulans* Linné (*D. exulans*—Kerguelen I.), but I do not think this species is its true host.

† Taschenberg gives *Sula fiber* (Hamburg Mus.) as the host of this species, but this cannot be so—its true host is probably *D. capensis* (Linné).

46. *meridionalis* (*Lipeurus*) Rudow (1869).

Beiträg zur Kenntniss der Mallophagen oder Pelzfresser. Diss., Halle, pp. 32–33.

Type-host : *Phœbetria palpebrata palpebrata* (Forster). (*Diomedea fuliginosa*) [Light-mantled Sooty Albatross].

Present status : *Perineus meridionalis* (Rudow).

47. *miriceps* (*Lipeurus*) Kellogg & Kuwana (1902).

Proc. Wash. Acad. Sci. iv. pp. 480–481, pl. xxx. f. 4.

Type-host * : ? *Diomedea irrorata* Salvin.

Present status : synonym of *Perineus confidens* (Kellogg).

48. *modestus* (*Lipeurus*) Giebel (1874).

Insecta Epizoa, Leipzig, p. 233.

Type-host : *Stercorarius pomarinus* (Temminck) (*Lestris pomarina*).

Present status : *Perineus modestus* (Giebel).

49. *mutabilis* (*Lipeurus*) Piaget (1880).

Les Pédiculines, Leiden, pp. 324–325, pl. xxvii. f. 1.

Type-host : *Fulmarus glacialis glacialis* (Linné) (*Procellaria glacialis*—Leyden Mus.) [Fulmar Petrel], and *Daption capensis* (Linné) (*Procellaria capensis*—Leyden Mus.).

Present status : synonym of *Perineus nigrolimbatus* (Giebel).

50. *nigricans* (*Lipeurus*) Rudow (1869).

Beiträg zur Kenntniss der Mallophagen oder Pelzfresser, Diss., Halle, pp. 40–41.

Type-host : *Pterodroma mollis mollis* (Gould) (*Procellaria mollis*—South Seas) [Soft-plumaged Petrel].

Present status : probably a species of *Perineus*, but almost unrecognizable, and may have to be discarded.

51. *nigrolimbatus* (*Lipeurus*) Giebel (1874).

Insecta Epizoa, Leipzig, pp. 233–234.

Type-host : ? *Fulmarus glacialis glacialis* (Linné) (*Procellaria* sp. from Arctica—" in höchsten Norden ")

Present status : *Perineus nigrolimbatus* (Giebel).

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* Kellogg and Kuwana give the host as *Geospiza fuliginosa* Gould (Albemarle I.), but this is not the true host—it is very probably the species suggested above.

52. *nigropunctatus* (*Lipeurus*) Enderlein (1917).

Zool. Anz. xlix. pp. 244–245, f. 5, 6, 7.

Type-host: *Diomedea exulans* Linné (*D. exulans*—Tristan da Cunha).

Present status: doubtful, until type is examined.

53. *obscurus* (*Lipeurus*) Rudow (1869).

Beitrag zur Kenntniss der Mallophagen oder Pelzfresser, Diss., Halle, pp. 30–31.

Type-host: *Macronectes giganteus* (Gmelin) (*Procellaria gigantea*).

Present status: *Perineus obscurus* (Rudow).

54. *pederiformis* (*Philopterus*) Dufour (1835).

Ann. Soc. ent. Fr. iv. p. 676, pl. xxi. f. 4.

Type-host: *Diomedea exulans* Linné.

Present status: *Episbates pederiformis* (Dufour).

55. *pelagicus* (*Lipeurus*) Denny (1842).

Monographia Anoplurorum Britanniæ, 1842, pp. 58–59, 173–174, pl. xiv. f. 2.

Type-host *: *Hydrobates pelagicus* (Linné) (*Thalassidroma pelagica*) [Storm Petrel].

Present status: *Synnautes pelagicus* (Denny).

56. *prioni* (*Lipeurus*) Enderlein (1909).

Deutsche Sudpolar-Expedition (1901–1903), x. Zoologie, ii. Bd., Heft 4, pp. 454–455, pl. lxi. f. 194, 196–199.

Type-host: *Pachyptila desolata desolata* (Gmelin) (*Prion desolatus* (Gmel.) [Dove Prion] and *Diomedea exulans* Linné (*D. exulans* L.—Kerguelen).

Present status: probably a synonym of *Naubates clypeatus* (Giebel).

57. *procellariæ* (*Pediculus*) Fabricius (1775).

Systema Entomologiæ, Flensburg, p. 808.

Type-host: "Brasiliæ procellaris."

Present status: unrecognizable—discard.

58. *procellariæ* (*Lipeurus*) Gurlt (1837).

Arch. Naturgesch. xxiii. pp. 300, 309.

Type-host: *Daption capensis* (Linné) (*Procellaria capensis*).

Present status: *nom. nud.*

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* Denny also gives *Oceanodroma l. leucorhoa* (Vieillot) as the host of this species, but the type-host was fixed by me in a paper dealing with the Denny Collection (Thompson, 1937).

59. *procellariæ* (*Nirmus*) Leach MS., Denny (1852).

List of Specimens of British Animals in the Collection of the British Museum, xi. p. 26.

Type-host : not stated.
Present status : *nom. nud.*

60. *pterodromi* (*Naubates*) Bedford (1930)

16th Rept. Vet. Res. S. Afr. p. 170, f. 10, 13.

Type-host : *Pterodroma macroptera macroptera* (Smith) (*Pterodroma macroptera* Gm.) [Grey-faced or Great-winged Petrel].
Present status : *Naubates pterodromi* Bedford.

61. *subangusticeps* (*Lipeurus*) Piaget (1880).

Les Pédiculines. Leiden, pp. 308–309, pl. xxv. f. 5.

Type-host : *Oceanodroma leucorhoa leucorhoa* (Vieillot) (*Thalassidroma leachi*—Rotterdam Zoo) [Leach's Fork-tail Petrel].
Present status : synonym of *Synnautes pelagicus* (Denny).

62. *setosus* (*Nirmus*) Giebel (1876).

Ann. & Mag. Nat. Hist. (4) xvii. p. 388.

Type-host : *Pelecanoides ? exsul* Salvin (*P. urinatrix*—Kerguelen I.) [Diving Petrel].
Present status : *Pelmatocerandra setosa* (Giebel).

63. *testaceus* (*Lipeurus*) Taschenberg.

Nova Acta Leop. Carol. xliv. pp. 135–136, pl. v. f. 3.

Type-host : *Daption capensis* (Linné) (*Procellaria capensis*).
Present status : a species of *Naubates*, and very probably an immature specimen of *N. fuliginosus* (Taschenberg). If the latter can be shown conclusively *testaceus* may have to stand in place of the name *fuliginosus*.

64. *tricolor* (*Lipeurus*) Piaget (1880).

Les Pédiculines, Leiden, pp. 363–364, pl. xxx. f. 4.

Type-host : *Phœbetria palpebrata palpebrata* (Forster) (*Diomedea fuliginosa*—Leyden Mus.).
Present status : synonym of *Perineus meridionalis* (Rudow).

65. *tuberculatus* (*Lipeurus*) Piaget (1885).

Les Pédiculines, Suppl., Leiden, pp. 61-62, pl. vi. f. 8.

Type-host *: *Fulmarus glacialis glacialis* (Linné) (*Procellaria glacialis*).

66. *unica* (*Bedfordiella*) Thompson (1937).

Ann. & Mag. Nat. Hist. ser. 10, xx. pp. 434-436, f. 1, 2.

Type-host: *Pterodroma brevirostris* (Lesson).
Present status: *Bedfordiella unica* Thompson.

67. *varius* (*Lipeurus*) Kellogg (1896).

Proc. Calif. Acad. Sci. ser. 2, vi. pp. 116-117, pl. vii. f. 3, 4.

Type-host: *Fulmarus glacialis rodgersii* Cassin (*Fulmarus glacialis glupischa* and *Fulmarus glacialis rodgersii*, Bay of Monterey, California).
Present status: synonym of *Perineus nigrolimbatus* (Giebel).

LVIII.—*Early Development Stages of Copepoda.*—II. Metridia lucens *Boeck.* By S. G. Gibbons, Ph.D., F.R.S.E., Naturalist, Fishery Board for Scotland, Aberdeen.

The similarity which exists between the larval forms of different species of copepods is largely responsible for the trouble experienced in ascribing to the many nauplii their correct specific names. Apart from actually breeding the forms, which is a laborious process and usually attended with unexpected difficulties, the systematist is forced to use circumstantial evidence for most of his identifications. Although this is, strictly speaking, scarcely a scientific method, I have used it in the case of the large amount of material at my disposal, collected by the Fishery Board's vessel 'Explorer,' in attempts to describe the nauplii of some of the more common or interesting copeopds found in our seas.

In the first paper of this series (Ann. & Mag. Nat. Hist. ser. 10, xviii. p. 384, Sept. 1936) I showed how the nauplius stages of *Eucalanus elongatus* were identified by their affinity to those of *Rhincalanus nasutus*, and since this was published Johnson, in Trans. Amer. Mic. Soc. lvi., Jan. 1937, has repeated the description of the stages of *Eucalanus*, finding, however, the full number (six) of nauplius stages instead of five. This comparison prompted me to publish a letter in 'Nature' (ccxvii.) on the possible significance of the differences in two such widely separated areas.

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* This cannot be the true host of this species—it is not a petrel parasite, and needs no further condition in this work.

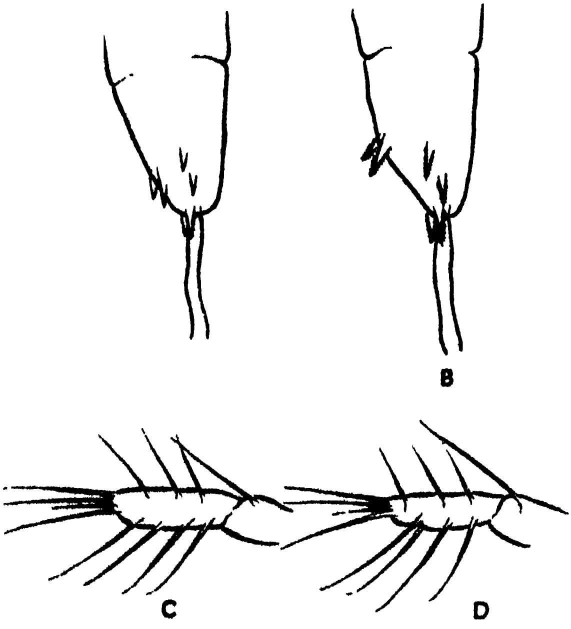
The present short paper describes the nauplii of a form common in Scottish waters and generally resembling *Calanus finmarchicus* in adult appearance. This is *Metridia lucens*, the nauplii of which have been picked out partly by their resemblance to *Calanus*, but chiefly by their numbers and occurrence only in those collections containing the adult form. So strong is the resemblance to the nauplii of *Calanus* that only in a more or less accidental manner were the two species separated in this early stage of development. A large collection of all stages of *Calanus* was being examined for nauplii of that species, which were very abundant. It was noticed, however, that some of the nauplii were more heavily spined posteriorly than others, but otherwise there was no outstanding difference. A more detailed examination was made, and several stages of the heavily spined nauplius were isolated. *Calanus* nauplii were present in abundance in stages 1 to 6, and the new, more heavily armed form up to stage 5, but in spite of extensive search no stage 6 of such a form appeared to be present in the collection. The only adult copepod in the material in any numbers, apart from *Calanus*, was *Metridia lucens*, so that it was more than probable that the new nauplius belonged to that species. An extensive hunt through many collections ensued, and the suggestion was confirmed, the heavily armoured nauplius occurring every time in conjunction with *Metridia* but not elsewhere.

One curious feature, however, remains unexplained—the absence of a sixth nauplius stage—for in spite of the most extensive search among a vast amount of material I have never been able to find a sixth nauplius stage corresponding to this form, that is to say, having eight marginal bristles on the dorsal edge of the first antenna. The absence of this stage, if indeed it really is absent, while with *Eucalanus* it is the first stage that is missing, presents a baffling problem. Nevertheless, since the object of these short papers is the general identification, I may perhaps be forgiven for stating nothing but the facts observed, resisting the temptation to deviate into the realms of theory as to the possible significance of such phenomena. Perhaps, too, the missing stage may ultimately be located.

DESCRIPTION OF THE NAUPLIUS STAGES.

Stage I. Length ·17 to ·18 mm.

Similar in form to *Calanus*, but very slightly smaller. The difference in size, however, which is to be found between this species and *Calanus* at all stages, is not sufficient to make itself obvious without careful measurement, and cannot therefore be taken as a distinguishing



A. Posterior part of body of *Calanus* nauplius stage IV.
B. Ditto of *Metridia* nauplius stage IV.
C. Distal joint of first antenna of *Calanus* nauplius stage IV.
D. Ditto of *Metridia* nauplius stage IV.

character for rapid identification. The limbs as in *Calanus*, but the two posterior "feelers" or spines on the body are considerably longer in *Metridia* and somewhat stouter. Otherwise distinction is extremely doubtful.

Stage II. Length ·21 to ·23 mm.

Here again the limbs are as in *Calanus*, with the longer posterior spines still predominating. As in the previous stage rapid distinction is very difficult, even in the most perfectly preserved of specimens.

Stage III. Length ·27 to ·28 mm.

In this stage the marked differences between *Metridia* and *Calanus* make their appearance.

The first antenna resembles that of *Calanus*, but the distal joint is rather narrower. The second antenna and mandible are also as in *Calanus*, but the posterior part of the body shows a considerable change. There is the same number of spines as in *Calanus*, but they are longer, heavier, and very markedly serrated. Most outstanding of all the ventral pair is placed much higher up the body than in *Calanus* and they point rather more outwards than backwards. This feature is present not only in this stage but also in the later stages, with the result that when the nauplii are seen in lateral view, as the figure shows, the identification is easy, quick, and certain

Stage IV. Length ·32 to ·34 mm.

First Antenna.—As *Calanus*, but the two anterior spines on the dorsal margin of the distal segment are very close together and appear to emanate from a tiny notch or depression in the integument, as shown in the illustration. This feature persists to the next stage, and in examining fragments of food in a fish stomach may be used safely as a means of identification.

Second Antenna.—As in *Calanus*, except for one or two of the finest hair-bristles, the numbers of which, requiring careful micro-dissection to count, are a most unsatisfactory means of identification in this or any other species.

Mandible.- As in *Calanus*, but the armature appears slightly heavier and stronger.

First Maxilla.—As in *Calanus*, but the endopodite has five bristles in place of four.

Posterior part of body.—Same number of spines as in *Calanus*, but strong and serrated as in the preceding stage, and the ventral pair again more anteriorly placed than in *Calanus*.

Stage V. Length ·40 to ·42 mm.

First Antenna.—As in *Calanus*, but the two anterior spines on the dorsal margin of the distal segment close together as in the preceding stage.

Second Antenna.—Exopodite eight-jointed, with eleven bristles (*Calanus* has seven joints with ten bristles). There are also additional bristles on the distal and proximal ends of the endopodite.

Mandible.—As *Calanus*, but slightly stronger in appearance.

First Maxilla.—As in *Calanus*, but with a total of eleven bristles on the endopodite. *Second Maxilla* rudimentary.

Posterior part of the body.—As in the preceding stage, but with the addition of one pair of lateral spines. The position and form of the spines corresponds with those of the two previous stages.

Stage VI. Not seen, and doubtful if present.

It is hoped that the foregoing descriptions will enable those interested to isolate at any rate the later stages of this form with ease. As I have already indicated there appear to be no obvious differences between the earliest stages of this form and those of *Calanus*, but it is hoped that long series of detailed measurements would separate them, as was found in separating the early stages of the two common species of *Oithona*. In the later stages, so long as part of the posterior region of the body is present, or even an unbroken distal joint of the first antenna, identification of *Metridia* nauplii, in the fragmentary form in which they are often found in young fish stomachs, should not be impossible.

LIX.—*New Species of Ants and a new Subgenus of* Dolichoderus *from various Localities.* By HORACE DONISTHORPE, F.Z.S., F.R.E.S., etc.

PONERINÆ Lepeletier.

Myopopone picea, sp. n.

☿. Dark blackish brown, anterior portion of lobes of frontal carinæ, antennæ, legs, and apex of gaster reddish, tip of antennæ lighter; shining; clothed with longer and shorter outstanding yellow hairs.

Head quadrate, posterior border emarginate, with very bluntly pointed posterior angles, sculpture consisting of very widely separated, shallow, larger and smaller, oblong punctures; *mandibles* rather narrow, parallel-sided, terminal border with a large tooth at apex, and two small teeth between it and a large tooth at base pointing backwards, internal border armed with three double teeth; *clypeus* concave with a thin slightly raised ridge on anterior border and a rather sharp tooth at each side; *antennal foveæ* slightly longitudinally striate; *frontal area* deep; *frontal carinæ* with a few fine striæ at sides of frontal area. The striæ of the head are much less marked than in *castanea* and there are none at the sides and on the *temples* as in that species. *Front* with larger and smaller widely scattered punctures as described above (almost smooth in *castanea*); *frontal furrow* short and slightly narrower than in *castanea*; *antennæ* 12-jointed, *scape* with a few punctures, *funiculus* slightly narrower at apex than in *castanea*. *Thorax* with finer striæ at sides; *pro-* and *mesothorax* more punctured, those of the former being longer; *epinotum* less punctured, transverse striæ of *declivity* much finer. *Petiole* quadrate (transverse in *castanea*) and less punctured, with no tooth beneath anteriorly; *post-petiole* slightly more punctured and less transverse; *gaster* less punctured, narrower in proportion; *sting* shorter, and blunter.

Long. 9·3 mm.

Type in B.M. Coll.

Described from a worker taken by the Oxford University Expedition in a clearing at the foot of Mt. Dulit, at the junction of the rivers Tinjar and Lejok, Sarawak, Borneo, 9. viii. 32.

This very distinct species is much darker in colour, the structure of the jaws is different, and as shown above it differs in many other ways from *Myopopone castanea* Smith, also found in Borneo.

CERAPACHYINÆ Forel.

Cerapachys (*Cerapachys*) *flavaclavata*, sp. n.

☿. Dark blackish brown, mandibles, antennæ, legs, and apex of gaster yellowish brown; the club (last joint of antennæ) yellow; femora and mandibles a little darker; shining, clothed with very fine sparse yellow hairs.

Head longer than broad, with very small round widely separated punctures, posterior border emarginate and with a narrow raised border, posterior angles pointed; *mandibles* broad and pointed at apex, very finely punctured, masticatory border finely dentate; *clypeus* short, anterior border widely rounded; *frontal carinæ* short, sharp, slightly divergent; *frontal furrow* very fine and short; *antennæ* 12-jointed, *scape* short thickened at apex, *funiculus* with transverse joints, except the last (the *club*) which is very large, oval, and pointed, nearly as long as the rest of the *funiculus*; *eyes* fairly large, slightly convex, narrowly bordered. *Thorax* narrow, convex, with even smaller and more scattered punctures than the head, sides slightly rugose posteriorly; *pronotum* with a narrow anterior border; *epinotum*, declivity round, flat, divided from dorsal surface by a narrow slightly raised margin. *Petiole* quadrate, convex, finely bordered anteriorly, very slightly punctate, with a small raised ridge, and a small blunt tooth posteriorly beneath; *post-petiole* broader and longer than petiole, very slightly punctate, broader at apex than at base, projecting forward beneath, junction between post-petiole and gaster finely transversely striate; *gaster* oval, narrowed behind, emarginate at base, with very fine scattered punctures.

Long. 2·7 mm.

Type in B.M. Coll.

Described from four workers taken by Miss L. E. Cheesman at Sabron, Dutch New Guinea, Cyclops Mountains, 1200 ft., in June 1936.

This species differs from *C.* (*C.*) *inconspicuus* Emery and *C.* (*C.*) *opacus* Emery from German New Guinea, and *C.* (*C.*) *terricola* Mann and its var. *tulagi* Mann from the Solomon Isles in colour, puncturation, etc. From the two last-named in structure also.

Myrmicinæ Lepeletier.

Aphænogaster (*Attomyrma*) *cavernicola*, sp. n.

☿. Reddish yellow, head, thorax, and antennæ more red; pedicel and gaster more yellow, legs lighter yellow, teeth of mandibles and eyes black. Somewhat shining, whole body clothed with yellow outstanding bristles.

Head long, oval, narrowed in front and behind, posterior border raised, but without a neck, cheeks longitudinally striate, rest of head with cross-striation forming a not very distinctly raised network, ground-surface covered with very small raised shining granules; *mandibles* long, armed with three rather long sharp-pointed teeth at apex, the apical one being considerably the longest, the second longer than the first, a small blunt tooth occurs halfway between the first tooth and the base of the mandible; *clypeus*, *frontal area*, and the sides of the *frontal carinæ* (which are long) with a few longitudinal striæ; *antennæ* long, *scape* thin and curved at base, broader at apex, extending beyond the posterior border of the head by nearly half its length; *funiculus* with joints gradually increasing in length and breadth, last joint not as long as the two preceding taken together. *Thorax* with ground-surface sculpture as in head, sides of *pronotum* transversely striate, pro-mesonotal suture well marked, *mesonotum* with anterior portion slightly raised forming a lozenge-shaped projection, the rest of dorsum flat and smooth, sides more rugose; *meso-epinotal suture* well marked, forming a deep shining furrow; *epinotum* rugose with transverse raised striæ in front and raised margins at sides, armed at base with two short sharp projecting teeth. *Petiole* with a rather long pedicel, and with a thin raised ridge on ventral surface; *post-petiole* in the form of a node, slightly higher than that of the petiole; *gaster* ovate, pointed at apex, smooth and shining, and with a few short longitudinal striæ at extreme base. *Legs* long.

Long. 6·7 mm. (circa).

Type in B.M. Coll.

This is a very distinct species and differs in colour and puncturation from all the known Oriental species.

Described from a ☿ taken by Major E. A. Glennie in Naldera Cave, Simla, India, in October 1937.

Meranoplus raripilis, sp. n.

☿. Brownish yellow, legs, antennæ, and gaster slightly paler, teeth of mandibles and post-petiole dark red, sculpture of head, thorax, and post-petiole coarse, forming a network of raised ridges, hairs very sparse and short.

Head subquadrate, narrower in front than behind, convex and rounded above, posterior border emarginate, posterior angles bluntly pointed beneath; *mandibles* narrow, longitudinally striate, armed with four rather short blunt teeth, the apical one being the longest and most pointed; *clypeus* flat, rounded in front and behind with four fine longitudinal carinæ; *frontal area* small, subtriangular, smooth; *eyes* prominent, but not very, large; *antennæ* not very robust, *scape* narrow at base, swollen towards apex, *club* longer than the rest of the *funiculus*, last joint as long as the two preceding taken together. *Thorax* broader than long, *dorsal area* without trace of sutures, and sides and base translucent; *pleural region* longitudinally striate; *pronotum* armed with a sharp tooth at anterior angles, thorax notched on each side where the pro-mesonotal suture would be; *mesonotum* with one curved tooth on each side below notch, one straight tooth at posterior angles. and two shorter ones between these at base; *epinotum* vertical, armed with a short sharp tooth at sides. *Petiole* longitudinally striate, cuneiform, rounded at apex, furnished beneath with a raised ridge having a very small projecting tooth anteriorly; *post-petiole* not as high as petiole, round, with a short small tooth anteriorly beneath; *gaster* finely alutaceous, with small scattered punctures, the anterior borders of which are slightly raised.

Long. 2·2 mm.

Type in B.M. Coll.

Described from a ☿ taken by Miss L. E. Cheesman in Dutch New Guinea, Cyclops Mountains, Sabron, 1200 ft., in June 1936.

This small species comes nearest to some of the small Australian species described by Crawley—*M. aureolus*

Craw., *M. hilli* Craw., etc.; but is quite unlike them in structure, sculpture, etc.

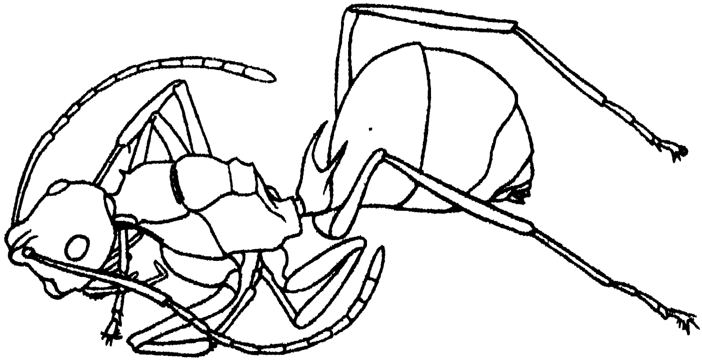
It is possible that the almost hairless condition of this insect may have been caused by its having been rubbed.

DOLICHODERINÆ Forel.

Dolichoderus (*Irenea*, subgen. nov.) *omyrmex*, sp. n.

☿. Head, thorax, petiole with spines, and scapes deep black, funiculi with first five joints at base, gaster, and legs brown, insertion of antennæ, maxillary and labial palpi, apex of mandibles, apex of first joints, and the last six joints of funiculi, and apex of tarsi yellow. Head, thorax, and petiole coriaceously sculptured, the dorsum of thorax, especially the pronotum, being longitudinally striate; gaster and legs very finely and closely punctured.

Head oblong oval, gradually narrowed from eyes to apex of mandibles, more sharply rounded from eyes to posterior border, the space between much shorter than from eyes to tip of mandibles; in profile the head with the frontal carinæ as high as long; *mandibles* very finely striate and punctate, armed with five sharp teeth, decreasing in length and sharpness from the apical one; *clypeus* large, convex, with a strong central carina, anterior border somewhat deeply emarginate and bidentate in centre; *frontal area* obsolete; no *frontal furrow*; *frontal carinæ* high and sharp; *eyes* large and projecting, placed



Dolichoderus (*Irenea*, subgen. nov.) *omyrmex*, sp. n., in profile.

near back of head; *antennæ* 12-jointed, *scape* long, reaching beyond posterior border of head by about half its length; *funiculus* with first joint long, second short, shorter than all the other joints; *maxillary palpi* 6-jointed, long, with very short first joint; *labial palpi* 4-jointed. *Thorax* narrowed to base, margined; *pronotum* flat, with a sharp-pointed tooth at anterior angles; *pro-mesonotal suture* very distinct, bordered anteriorly; *mesonotum* flat, with a small projecting tubercule on each side before declivity; with anterior angles and sides rounded; *meso-epinotal suture* finer and less marked, but distinct; *epinotum* with *base* flat, somewhat sloping downwards; *declivity* longer than base, almost straight, forming an abrupt angle with it. *Petiole* armed with two long, slightly curved, upstanding spines; *gaster* short oval, cloacal orifice in the shape of a slit, but formed as in *Technomyrmex*, not as in *Dolichoderus*.

Long. 6·4 mm.

Subgenotype, *Irenea omyrmex*, sp. n., in Brit. Mus. Coll.

Described from a worker taken by Miss L. E. Cheesman at Mt. Nomo, south of Mt. Bougainville, 600–1500 ft., Dutch New Guinea, in February 1936.

This insect is very like a *Polyrhachis*, and indeed might well be taken for a species of *Polyrhachis* (*Myrma*) except for the cloacal orifice.

In the 'Genera Insectorum' Emery separated the then recognized subgenera of *Dolichoderus* as follows:—

"OUVRIÈRES.

1. Mesonotum plus long que large	1. Subgenus *Dolichoderus* Lund.
Mesonotum au plus aussi long que large ..	2.
2. Ecaille du pétiole terminée au sommet par un angle ou une épine impaire; pronotum presque toujours biépineux ou bianguleux.	2. Subgenus *Monacis* Roger.
Ecaille du pétiole jamais terminée par un angle ou une épine impaire; pronotum rarement biépineux	3. Subgenus *Hypoclinea* Mayr."

The only subgenus our insect could fit into would be *Hypoclinea* Mayr, but Emery points out further that the petiole is generally in the form of a blunt scale, generally truncate or bidentate at the summit. That does not include two long spines; nor will the form of the cloacal orifice do for *Hypoclinea*.

Wheeler, in 1935, separated a number of species from *Hypoclinea* to form four new subgenera—*Monoceratoclinea*, *Diabolus*, *Diceratoclinea*, and *Acanthoclinea*, but none of these would include our species. It comes in the tribe *Dolichoderini* Emery on account of the texture and sculpture of the integument, but the shape of the cloacal orifice does not agree with that of *Dolichoderus*. It seems, however, safer not to make a new genus on only one specimen.

LX.—*New Species of American Heterocera in the United States National Museum* (*Lepidoptera*). By W. Schaus.

The following descriptions represent new species sent for identification by correspondents interested in the Neotropical fauna.

Arctiidæ.

Ecpantheria hambletoni, sp. n.

The species belongs to the group with pectinated antennæ.

Male.—Antenna black, the base of shaft white. Head white. Collar and thorax pale smoke-grey with fine black dorsal line and similar lines subdorsally and laterally on patagia. Abdomen dorsally indulin-blue, underneath white. Legs with fine black lines and minute spots. Fore wing above with the costa, base, and inner margin opaque white, the costa with fine, pale, drab-grey spots edged with fine black lines; oblique, coalescent, smoke-grey spots at base below costa and from near base of inner margin, also similar spots more upright postmedially and subterminally, the wing otherwise hyaline. Hind wings hyaline above, the inner margin broadly opaque white. Wings similar underneath. The costa of hind wing opaque white with two small black spots.

Female.—Body similar to male. Fore wing dull white with smoke-grey spots finely edged with black; basal spots oblique, larger than in male; antemedial spot on costa large, outcurved, from cell incurved; medial line of spots smaller, in cell followed by black line on discocellular; a postmedial curved line of still smaller spots; subterminal spots larger from vein 4 to costa; small terminal spots on interspaces. Fore wing below very similar to above. Hind wing with the costa broadly white with two broad black spots.

Expanse, male 51 mm., female 65 mm.

Habitat.—Campinas, Sao Paulo, Brazil.

Type.—U.S. Nat. Mus. No. 34723.

Collected by E. J. Hambleton.

Ecpantheria campinasa, sp. n.

Male.—Antenna simple. Head white, the frons black. Collar white with two large, black, circular spots. Thorax white with two paired, narrow, black-edged, oval spots, the patagia edged with black lines, black points on metathorax. Abdomen above with the base broadly white, tipped with black, followed by an orange transverse line, then dorsally suffused with blue; a lateral series of orange points; ventrally with fine dark and pale lines Fore wing above with the costa, the base broadly, and inner margin opaque white, the rest of wing faintly hyaline; costa with black spots, otherwise the wing with series of greyish spots defined by fine dark lines, the spots of each series chiefly contiguous, inbent from below costa. Hind wing semihyaline, white, the inner margin broadly opaque with dark point on anal angle. Fore wing with the markings somewhat evanescent below. Hind wing below as above, the costa broadly opaque with faint spots

Expanse 60 mm.

Habitat.—Campinas, Sao Paulo, Brazil.

Type.—U.S. Nat. Mus. No. 34724.

Received from E. J. Hambleton.

LITHOSIINÆ.

Callisthenia schadei, sp. n.

Male.—Palpi pale rose-colour. Head and thorax fuscous. Collar and tips of patagia pale yellow. Abdomen strawberry-pink above, underneath orange-pink with fuscous segmental lines. Legs fuscous with orange-pink or yellowish streaks. Fore wing baryta-yellow above; costa and termen finely black, this colour interrupted postmedially on the former; a broad, almost medial, black band slightly curved, crossed by some baryta-yellow markings, narrower on inner margin; a rather large, flame-scarlet spot at discocellular; a postmedial, coarse, black, sinuous line followed by similar streaks on veins, mostly interrupted and not reaching termen; cilia fuscous at base, broadly tipped with white except at anal angle. Hind wing peach-red above; a round black spot at apex; cilia somewhat yellowish. Fore wing strawberry-pink below; an almost medial, transverse, black band; termen broadly black, widest at costa. Hind wing below as above.

Expanse 15 mm.

Habitat.—Santa Barbara, Paraguay.

Type.—U.S. Nat. Mus. No. 34732.

Illice vilaricencis, sp. n.

Male.—Palpi ochraceous-orange, the third joint black. Head and body black, the throat, vertex, and collar ochraceous-orange. Wings black above, fuscous underneath.

Expanse 17 mm.

Habitat.—Villa Rica, Paraguay.

Type.—U.S. Nat. Mus. No. 34731.

Syntomidæ.

Lymire vedada, sp. n.

Male.—Antenna and frons black; vertex orange-buff. Collar and thorax drab, the collar edged in front and at sides by a cream-coloured line which reaches shoulders. Abdomen above blue-black covered at base with drab hairs from metathorax, the anal segment tipped with drab-grey; thorax and abdomen white below, the throat and fore femora in part orange-buff. Fore wing drab above; a maize-yellow line on costa from base to apex, finely edged with black anteriorly from base to middle of wing. Hind wing semihyaline white, the costa and termen irregularly smoky black. Fore wing hair-brown below, the costal edge at apex narrowly white. Hind wing below as above.

Expanse 28 mm.

Habitat.—Vedada, Habana, Pinar del Rio, Cuba.

Type.—U.S. Nat. Mus. No. 34609.

Collector: H. Roberto.

Antichloris clementi, sp. n.

Male.—Antenna black. Head and body dark metallic-blue. Fore wing bluish green; some dark metallic-blue scaling at base, and a streak below costal edge on basal third; cilia fuscous. Hind wing with costal margin glossy pale grey, edged below with verona-brown and crossed at apex by three oblique dark lines; wing otherwise to termen and inner margin, black with some argus-brown shading; a terminal, small, scarlet-red spot above vein 3. Fore wing below as above, the inner margin glossy pale grey where covered by costa of hind wing. Hind wing below having costal margin with a large, metallic, greenish-blue space; inner margin and termen to above the scarlet-red spot bluish black.

Expanse 33 mm.

Habitat.—Santiago, Cuba.

Type.—U.S. Nat. Mus. No. 34608.

A series in the U.S. National Museum collected by Frère Clement.

Allied to *A. quadricolor* Walker from Jamaica.

Pseudaclytia bambusana, sp. n.

Male.—Antenna with shaft grey, pectinations fuscous. Palpi, head, collar, and thorax drab-grey; a white line from vertex to shoulders. Abdomen primuline yellow above, white underneath with a broad, ventral, blackish line from base, not reaching last segment. Fore wing pale buffish grey (no colour in Ridgway to correspond with it); some darker irrorations at apex; a black point on discocellular; dark terminal points on interspaces. Hind wing drab-grey. Fore wing ecru-drab below with darker suffusions in and below cell. Hind wing below as above.

Expanse 32 mm.

Habitat.—El Cano, Habana, Cuba.

Type.—U.S. Nat. Mus. No. 34610.

Collected by S. C. Bruner and H. Roberto.

Mydromera carmina, sp. n.

Male.—Antenna black. Palpi scarlet tipped with black. Head and collar scarlet-red. Abdomen dark metallic-blue. Fore wing fuscous-blue with metallic-blue suffusions below costa and at base of inner margin. Hind wing metallic-blue at base, the termen broadly fuscous-blue. Wings brilliant dark metallic-blue below, their termina narrowly fuscous-blue.

Expanse 33 mm.

Habitat.—Santiago, Cuba.

Type.—U.S. Nat. Mus. No. 34611.

Collected by Frère Clement, four males and four females in collection. Apparently common in the hills back of Santiago.

Ctenucha bruneri, sp. n.

Male.—Antenna with the shaft light drab, the pectinations black. Head, thorax, and wings cinnamon-drab. Abdomen cinnamon-drab, the last three segments raw sienna. Fore femora colonial-buff, the fore tibia with a white line. Wings without markings above or below.

Expanse 43 mm.

Habitat.—Sierra Rangel, Cuba.

Type.—U.S. Nat. Mus. No. 34612.

Collected by J. Acuna and S. F. Bruner.

Pericopidæ.

Hyalurga cinda sp. n.

Male.—Antenna black. Head and collar white, the frons edged below with black, and a black line between the antennæ. Thorax and abdomen ochraceous-buff above; a white line on tegula, a dentate, sublateral, black line; greyish transverse lines ventrally. Fore wing ochraceous-buff with three or four white spots, a large spot below cell at vein 2 edged with fuscous, a very small spot on discocellular, and a small spot subterminally between veins 4 and 5, also a white point at base. Hind wing with a little less than half the basal space white, somewhat hyaline; terminal space broadly ochraceous-buff; cilia white on inner margin, tipped with white on termen. Fore wing below yellow-ochre; the spot at discocellular as above, the spot below cell large, broadly elongate, reaching base, semihyaline in appearance. Hind wing below as above.

Female.—Head, collar, and thorax ochraceous-buff. Abdomen vinaceous-cinnamon above, white underneath as in male; anal hairs sudan-brown. Fore wing tawny-olive; base of inner margin from below median orange-buff, partly edged with white anteriorly from base; hind wing ochraceous-orange, the costa broadly suffused with tawny-olive; cilia white at anal angle. Fore wing below entirely tawny-olive. Hind wing below as above, the base of costal margin suffused with orange-buff.

Expanse, male 53 mm., female 43 mm.

Habitat.—Las Animas, Sierra Rangel, Pinar del Rio, Cuba.

Type.—U.S. Nat. Mus. No. 34607.

Collected by S. C. Bruner and H. Roberto.

Two males and two females in collection.

Noctuidæ.

Cirphis doroni, sp. n.

Female.—Head and a transverse line on collar vinaceous-fawn. Thorax and patagia light ochraceous-buff. Abdomen dorsally light buff at base, also the anal hairs, otherwise dusky-brown with whitish transverse lines, laterally white with a sublateral, dark livid-brown line, underneath light greyish-vinaceous. Fore wing light ochraceous-buff with a few scattered scales; a dark purple streak on base of median vein and a shorter streak on base of inner margin, the streak on median continued through cell; slightly expanding at termen; a subterminal series of black points inbent from vein 6 to below vein 2; a terminal series of black points from below apex, replaced above tornus by an irregular black spot. Hind wing white. Fore wing brownish-drab below, the costal edge white, the termen more broadly white. Hind wing pallid purple-drab below, the margins white.

Expanse 35 mm.

Habitat.—Virginia, S. Minas Geraes, Brazil.

Type.—U.S. Nat. Mus. No. 34688.

Cirphis eyre, sp. n.

Male.—Head and collar écru-drab, crossed transversely by four dark lines; patagia paler, dark anteriorly. Abdomen drab above with fine white transverse lines. Fore wing pale cinnamon-buff; median vein and discocellular white with a drab streak below the vein, and a finer streak above vein 4, expanding to above vein 5 on termen;

a black point in end of cell; a postmedial curved series of black points on veins; terminal small black spots on interspaces. Hind wing white; fine terminal black lines on interspaces from vein 3 to vein 6. Fore wing white below, with traces of the dark streaks. Hind wing white below. Both wings with the terminal black spots.

Expanse 28 mm.

Habitat.—Nova Teutonia, Brazil.

Type.—U.S. Nat. Mus. No. 34691.

Cirphis hildrani, sp. n.

Male.—Head and collar drab, the latter with two darker transverse lines and a posterior line of white scales. Patagia vinaceous-buff, the metathorax similar with two dorsal black spots. Abdomen mostly greyish-olive above with darker transverse lines, and long white hairs laterally at base, underneath pale cinnamon-drab. Fore wing vinaceous-buff with some black irrorations below cell; a black point at end of cell, and a larger irregular black spot between veins 3 and 5 at cell; postmedial small, dusky spots on interspaces followed by black points on veins; termen with minute black points on interspaces. Hind wing white with small black points from vein 3 to apex. Fore wing pale brownish-vinaceous below, the inner margin white; black at end of cell at subcostal, and at bases of veins 3 to 5; cilia dark grey and minute black points on termen. Hind wing white below, the costa slightly vinaceous with some dark irrorations; terminal black points as above.

Expanse 36 mm.

Habitat.—Nova Teutonia, Brazil.

Type.—U.S. Nat. Mus. No. 34690.

Cirphis ezrani, sp. n.

Male.—Head white. Collar and thorax vinaceous-fawn, the patagia with a few black scales. Abdomen with basal segments pale greyish-vinaceous with small dorsal black tufts, terminal segments deep olive-buff; anal hairs vinaceous-buff. Fore wing glossy vinaceous-buff with black irrorations below cell, on inner margin, and on costa; a black point in lower angle of cell followed by a black spot above vein 4 at discocellular; veins to termen with some fuscous streaks; traces of a faint postmedial line; termen faintly darker-shaded; terminal black points on interspaces; cilia mostly white. Hind wing and cilia white, some terminal black points. Fore wing buffy-white below; a dark streak below costa medially; terminal points as above. Hind wing white below, the terminal points larger.

Expanse 35 mm.

Habitat.—Itatiaya, Est. do Rio, Brazil.

Type.—U.S. Nat. Mus. No. 34687.

Cirphis domnita, sp. n.

Male.—Head, collar, and thorax pale brownish-drab, the collar with a few black irrorations. Abdomen dark olive-buff above. Fore wing with base and costa broadly buffy-white; a black line from beyond base along median vein to vein 4 with a dark oblique line angled before apex; a black point in cell, and an upright short line at discocellular; a faint upright line from inner margin near base; the inner margin vinaceous-buff, darker toward termen; a few marginal dark points. Hind wing white, the termen narrowly light drab, darker at apex. Fore wing hair-brown below; costa narrowly vinaceous; termen white, inner margin broadly white; a subterminal black line; a terminal series of black points on interspaces; cilia silvery-white. Hind wing below white irrorated with black points; a black point at end of cell; a postmedial series of black points on veins; terminal points as on fore wing.

Expanse 37 mm.

Habitat.—Nova Teutonia, Santa Catharina, Brazil.

Type.—U.S. Nat. Mus. No. 34692.

Cirphis fagani, sp. n.

Male.—Head light buff. The collar similar with a few black scales, a dorsal fuscous line, and a single transverse line. Patagia slightly vinaceous. Abdomen white at base, also the anal hairs, medially slightly vinaceous with two black spots at base. Fore wing pale greyish-vinaceous irrorated with black scales on costa and inner margin; some black scales at lower angle of cell, and a small spot between veins 3 and 5 at discocellular; a postmedial, lunular, dentate line with the lunules black, and black points on veins; terminal black points on interspaces. Hind wing white with a fine, terminal, pallid quaker-drab line. Wings white below, the fore wing faintly pale greyish-vinaceous with some darker shading on costa above cell and at lower angle of cell; postmedial line very faintly indicated; terminal black points as above, the hind wing more heavily scaled on costa and with a few terminal black points.

Expanse 32 mm.

Habitat.—Itatiaya, Est. do Rio, Brazil.

Type.—U.S. Nat. Mus. No. 34689.

Cirphis guascana, sp. n.

Male.—Head and collar light vinaceous-fawn. Thorax and patagia white mottled with purplish hairs. Abdomen pallid vinaceous-drab above with dark transverse lines; white laterally. Fore wing with costal edge and inner margin deep brownish-drab, also the cell, the dark colour bifurcating beyond cell above vein 5; the veins terminally also dark with terminal black points on interspaces; a pale greyish-vinaceous streak below costa to beyond middle and a broader streak above vein 5 to termen, a similar streak below cell. Hind wing white, small terminal black spots from vein 2 to apex. Fore wing below with a whitish streak below costal edge, the termen and inner margin broadly white, the disc with purplish suffusions. Hind wing below pale brownish-drab, the margins white.

Expanse 33 mm.

Habitat.—Pueblo Guasca, Colombia.

Type.—U.S. Nat. Mus. No. 34693.

Cucullia hildana, sp. n.

Female.—Head and collar vinaceous-slate. Thorax paler with fuscous hairs laterally. Abdomen vinaceous-grey. Fore wing with costal edge finely fuscous and a pale greyish-vinaceous streak below it expanding towards apex, and the termen from vein 5 to tornus of the same colour; the cell and a streak to termen vinaceous-grey; an upcurved fuscous line before tornus from inner margin to vein 2; a terminal black line from tornus to vein 5. Hind wing whitish at base, on inner margin, and also the cilia, the wing otherwise citrine-drab, with traces of a medial line. Wings below with a similar pattern, but less defined.

Expanse 44 mm.

Habitat.—La Rioja, Argentina.

Type.—U.S. Nat. Mus. No. 34702.

Pæctes maricia, sp. n.

Male.—Palpi tawny, darker at end of second joint, the third joint sayal-brown tipped with black. Head, collar, and thorax mottled dusky-drab and sayal-brown, the long hairs from metathorax tipped with black. Abdomen light vinaceous-cinnamon above with transverse black lines, the dorsal rufts cinnamon on basal segment, otherwise fuscous; underneath largely cinnamon. Fore wing with base drab mottled with benzo-brown, on costa broad, oblique, black lines; a subbasal, pale drab-grey line from costa to the large fovea at base of inner margin, this last smoke-grey edged below by fuscous; antemedial line fuscous, outangled on costa, then straight and inbent to lower edge of fovea, followed by a drab-grey fascia irrorated with white on costal margin where it is crossed by a sinuous brown line, in cell adjoining a large buffy-brown spot edged with white and a fine, black, proximal line, the outer edge of the brown spot suffusing with the thick black reniform which contains iron-grey scaling; above the reniform and extending to costa an irregular black spot, below it a black macular line to inner margin medially, this latter followed from below cell by a light drab space which is distally edged by benzo-brown from vein 2 to inner margin, and contains some black spots; the reniform is distally edged by a white line followed by irregular benzo-brown and drab markings extending to costa; an outer, fine, black line, rather broadly edged with white on both sides, very oblique and sinuous from subcostal to vein 6, excurved to vein 4 and inbent to inner margin, the space where excurved filled in with white and buffy-brown mottling and some fuscous spots, the whole limited proximally by a vertical white line; costal margin beyond outer line mottled with pale ochraceous-buff, below it adjoining the line, with benzo-brown spots; a fine irregular subterminal white line; termen iron-grey with irregular white streaks on interspaces; cilia mottled iron-grey and drab. Hind wing benzo-brown above, paler at base ; a macular terminal black line ; cilia drab at base followed by a dark line, the tips white. Under side of fore wing light cinnamon-drab, the inner margin white ; traces of an outcurved outer line ; terminal white suffusions from vein 3 to tornus. Hind wing whitish below on basal half with brownish suffusions from below costal margin ; a large fuscous spot at discocellular, and a similar postmedial line ; termen broadly benzo-brown ; a thick terminal black line cut by veins, preceded on interspaces by quadrate white spots from vein 6 to anal angle ; the cilia without white tips.

Expanse 25 mm.

Habitat.—Itatiaya, Province of Rio de Janeiro, Brazil.

Type.—U.S. Nat. Mus. No. 34532.

Pucialia canalalis, sp. n.

Female.—Palpi wood-brown above, tilleul-buff underneath. Head wood-brown. Thorax tilleul-buff ; collar and tegulæ light vinaceous-fawn at base and terminally, otherwise buffy-brown with pale segmental lines. Underside of body pale pinkish-buff. Fore wing pinkish-buff to postmedial line which is silvery and inwardly edged with diffuse Hay's russet which emits short streaks basad, darker below vein 2 with an inangled line on submedian fold and a longer dentate line to inner margin antemedially ; some black and brown streaks in cell forming a diffuse spot ; the postmedial line, from subcostal to vein 3, outwardly edged by a linear 8-shaped spot filled in with silvery-grey, from vein 3 to inner margin by pinkish-buff ; the outer portion of wing is largely olive-green with dark olive-grey markings ; an outer crenulate army-brown line irregularly outbent from costa, incurved from vein 6 to vein 4, inbent to postmedial line at vein 3, distally edged with silvery-grey, followed by fuscous line forming annuli between veins 6 and 4 ; a cinnamon-brown streak above vein 7 and a shorter streak above vein 8 at apex, cut on costa by the subterminal whitish line, which is wavy to vein 6, then lunular dentate to inner margin ; terminal line olive-brown, wavy ; cilia with dark lunules. Hind wing semi-hyaline, white ; some iridescent scales in cell ; veins 6 and 7 fuscous, the other veins fuscous terminally ; fuscous suffusions on terminal interspaces ; cilia pale olive-buff without spots. For wing below with basal space paler than above and with a fuscous streak in cell ;

outer space benzo-brown, the costa with four white spots. Hind wing below with the terminal suffusions much reduced; subterminal fuscous points on veins.

Expanse 31 mm.

Habitat.—Campo Bello, Prov. of Rio de Janeiro, Brazil.

Type.—U.S. Nat. Mus. No. 34565.

Geometridæ.

Œnothalia paluma, sp. n.

Male.—Antennal shaft black above, underside and pectinations ochraceous-tawny. Palpi and frons vinaceous-buff. Vertex fuscous. Collar deep mouse-grey. Thorax benzo-brown. Abdomen above with basal segments alternately army-brown and black, followed by black dorsally and brownish laterally. Fore wing with the costal margin broadly dark neutral grey, not quite reaching apex, the wing below it buckthorn-brown largely obliterated by the fuscous transverse lines; a fine basal line; an antemedial spot in cell; a broad wavy medial line; an almost vertical postmedial line; a subterminal line slightly incurved below costa, sinuous below vein 4; a terminal fuscous spot between veins 3 and 4 connected with the subterminal line. Hind wing of a similar basic colour, the antemedial line broad with lighter suffusions at base and distally finely dentate; the medial space mostly clear with only a fine broken line before the broad postmedial line which is incurved below costa, outbent and lunular between veins 4 and 2, and inbent and dentate to inner margin; termen with black striæ and black spots above and below vein 2. Fore wing vinaceous-drab below with faint traces of antemedial and medial lines; the costa fuscous terminally; a short black line on discocellular and a small terminal black spot above vein 4. Hind wing vinaceous-drab below; a black line on discocellular; traces of a postmedial shade; termen between veins 2 and 4 somewhat lilacine with the two black spots as above.

Expanse 36 mm.

Habitat.—Pinar del Rio, Cuba.

Type.—U.S. Nat. Mus. No. 34660.

Collected by Frère Roberto.

Almodes chapadaria, sp. n.

Male.—Antenna and body wood-brown. Abdomen with transverse fuscous bands above ; partly white below with dark bands. Fore wing wood-brown above, the antemedial and terminal space somewhat buffish, the lines fine, fuscous ; antemedial line outangled in cell, inbent to inner margin, with faint dark points below cell and on inner margin ; an outangled medial line below cell , reniform faintly defined by a black line and containing a faint black mark ; outer line somewhat excurved from costa, shortly outangled at vein 4, then incurved to inner margin near the medial line ; a subterminal dark line from vein 6 to vein 4 ; marginal fuscous striæ ; a terminal fine black line expanding on interspaces. Hind wing wood-brown above with fine black striæ and points ; a fine faint antemedial line ; a dark discal point with white centre followed by the nearly straight medial line ; postmedial line wavy and crenulate, black sharply defined, distally with dark suffusions ; marginal dark suffusions ; the terminal line as on fore wing. Wings buffish-white below with drab and fuscous striæ and irrorations more intense on costa of fore wing ; lines as above without the dark suffusions on hind wing.

Expanse 51 mm.

Habitat.—Chapada, Brazil.

Type.—U.S. Nat. Mus. No. 54531.

This and the following species have the pectinations of antenna much longer than in the other species of the genus.

Almodes igualaria, sp. n.

Male.—Head and shaft of antenna black, finely edged above with whitish-buff. Thorax and abdomen whitish, irrorated with light drab and fuscous ; collar posteriorly and tegulæ at shoulders benzo-brown ; abdomen above with segmental fuscous scaling, underneath pale drab-grey with fine white segmental lines : legs partly streaked with buffy-brown. Fore wing above with base and termen whitish thickly mottled with drab and fuscous irrorations and striæ ; a dark basal line, inangled at base of cell, then outcurved, followed below cell by some dark scaling ; antemedial line remote, double, outbent on costa, outcurved in cell, excurved from within cell to below it and inbent to inner margin near base, preceded by white mottling from within cell; medial space wood-brown with dark mottling; reniform small, white, black-edged; space from cell to postmedial whitish, mottled as on termen; postmedial line remote, fine, fuscous, punctiform opposite cell, inbent, sinuous below vein 3, and partly double; the terminal mottling thicker between veins 5 and 7; a terminal fine, black, crenulate line thickened on interspaces. Hind wing predominantly buffy-brown; a subbasal, oblique, black line; traces of an antemedial line; a white discal point edged with black, followed by a distinct fine, medial, black line; postmedial line double from costa to vein 5, then single and broader, excurved on inner margin followed throughout by distinct white scaling; marginal white lunules, and white mottling on termen above the crenulate, black, terminal line. Wings below buffish white with dark striæ and irrorations; lines fine, faint; white discal points present.

Expanse 49 mm.

Habitat.—Iguala, Mexico.

Type.—U.S. Nat. Mus. No. 34530.

A difficult species to describe, owing to confused markings, but the white markings conspicuous.

LXI.—*Report of the Percy Sladen Expedition to Lake Huleh; a Contribution to the Study of the Fresh Waters of Palestine.* By Roger Washbourn, B.A., and R. F. Jones, B.Sc.

[Plates XVI. & XVII.]

INTRODUCTION.

As early as 1858, when Tristram first made his journeys to Palestine, the geographical relationships of the flora and fauna were shown to be some of the most interesting features of the biology of this region. In his report, 'The Flora and Fauna of Palestine,' Tristram recorded that though the flora and fauna of this southernmost part of Sclater's Palæarctic region were Palæarctic, there was an unexpected Ethiopian element in all the groups he studied. The proportions of this Ethiopian element were largest in the Mammalia, of which 30 per cent. of the Palestinian species were Ethiopian. The

Birds showed 10 per cent. of Ethiopian species, and though species of Fish common to both Palæarctic and Ethiopian regions were not so numerous, there were many endemic species clearly of Ethiopian affinity. Tristram also noted that the distribution of these Ethiopian species throughout Palestine was very uneven. In the Jordan Valley, particularly in the southernmost part, the facies of the flora and fauna was different from that of the rest of the country, and here the Ethiopian element showed its greatest development. The flora and fauna of the Jordan Valley were in fact islets of the Ethiopian region in the midst of a Palæarctic country. These facts were to be explained by reference to the geological history of the region. At an early, preglacial period the distribution of the warm-loving Ethiopian forms was wider than it is at present, but with the onset of a glacial period the majority of these became extinct In the warm Jordan Valley, however, a certain number of these succeeded in withstanding the competition of immigrant Palæarctic forms, and these relicts form the Ethiopian element of the present fauna. Tristram regarded the river fishes as the oldest part of the fauna, and suggested that it was possible that they had ascended into Palestine from East Africa, through a continuous series of lakes occupying the Great Rift Valley, which might have formed a river system common to both the Jordan and the rivers of East Africa.

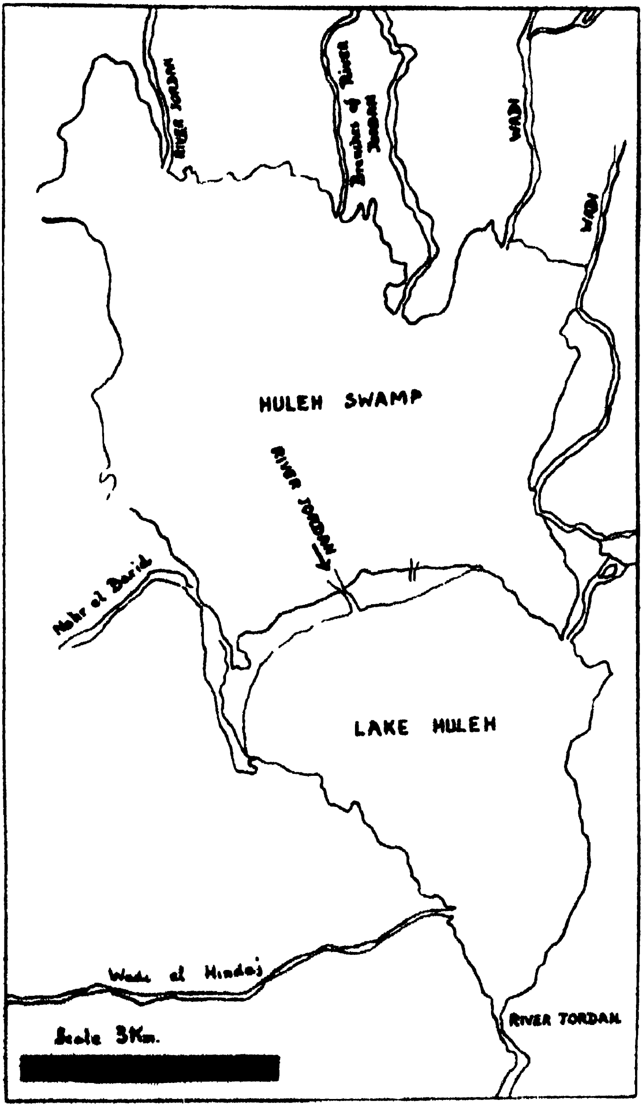
The zoo- and phytogeographical interest of the biology of Palestine is that the Jordan Valley has a flora and fauna in which there is a considerable Ethiopian element. Since Tristram's journeys a number of workers have studied both flora and fauna, but it is somewhat surprising that the animals and plants of the fresh waters have been very little studied. In 1890 Barrois examined the fauna of several Syrian lakes, notably those of the northern part of the Jordan, Lakes Tiberias and Huleh. In his reports he did little more than give a fauna list and a description of each lake, and made no reference to any possible geographical relations possessed by the species he recorded. The only complete general account of the fresh waters was that of Annandale (1912), who studied Lake Tiberias: his fauna lists remain to-day the most complete account of the fauna of this part of the Jordan system. Annandale showed that the fauna of Lake Tiberias was Palæarctic, with an intrusion of an Ethiopian element in the fishes (the fishes of the family Cichlidæ). No species of invertebrate was found which could definitely be regarded as Ethiopian. In explanation of these facts Annandale, like Tristram, regarded the common river system of the Great Rift Valley as being the most likely means whereby the fishes of East Africa made their way into Palestine. He suggested that the complete absence of invertebrates in the Ethiopian element might be due to their great delicateness, and to the fact that during the hot dry epochs of the past the Jordan river system must have been reduced in size, and may well have been saline. Only the exceedingly hardy Cichlid fishes could have withstood such conditions.

In his recent book 'Animal Life in Palestine' Bodenheimer has given the most complete account of the biology of this region, together with a summary of much of the early work. Although the main facts which were previously established are not altered, the use of different zoogeographical regions, based on modern studies, makes previously established facts more interesting. The Palæarctic subkingdom is divided into four, which are called respectively the Eurosiberian, the Saharo-Sindian, the Irano-Turanian, and the Mediterranean regions. The Ethiopian subkingdom, as far as it concerns Palestinian species, becomes the Sudano-Deccanian region. The distribution of the animals is described by reference to these regions. Bodenheimer has also given an account of those changes in the geological history of the country which may have influenced the flora and fauna. Palestine, when it first emerged from the sea in the Eocene period, was part of the African continent, and the flora and fauna must have been Ethiopian. At a later period in its history a land connection was formed with the southern part of the European continent, and thus the immigration of Palæarctic forms first became possible. Climatic changes later caused the Jordan system to be reduced to a single saline lake, thus destroying the original fresh water fauna. With the return of a cold climate, the fresh waters were repeopled from the north, while the existing Ethiopian land animals were only able to survive in the warmer parts of the Jordan Valley.

These important zoogeographical theories depend in a large measure on the completeness of our knowledge of the flora and fauna, and even to-day the fresh waters are very imperfectly known. Lake Tiberias was fairly completely studied by Annandale, but the northern and southern parts of the Jordan Valley have been very superficially studied. Lake Huleh, in the north of Galilee, would not at first sight seem a very likely *niche* for Ethiopian relicts, but the presence of papyrus, a plant of African origin, together with its ecological distinctness, precluded us from assuming that Ethiopian forms were absent, and it was clear that until a survey had been made of this part of the Jordan system our knowledge would be incomplete. Such a survey became urgent when, in 1934, it was learned that it was proposed to canalize the Upper Jordan and to reclaim Lake Huleh for agricultural purposes. An expedition was therefore financed by the Percy Sladen Memorial Fund, with the object of studying the flora and fauna of Lake Huleh and of carrying out a general biological survey. Leaving England in July 1936 the two authors, who were at the time Teaching Scholars at Birmingham University, worked at Lake Huleh until December of the same year.

A DESCRIPTION OF LAKE HULEH.

Lake Huleh, known also as the Waters of Merom, is the smallest and most northerly of the three lakes of the Jordan system. It is situated in the extreme north-eastern corner of the mandated territory of Palestine, and lies at the southern end of a broad plain surrounded on all sides by mountains. To the north this plain is enclosed by the foothills of Mount Hermon, to the west and to the east by parallel ranges of hills continuous with those of the more southern parts of the Jordan Valley, while on the southern side the enclosure is completed by a low range of hills running from east to west across the valley. The River Jordan rises near Banias, in Syria, and after running through fertile country in the northern half of the plain enters a vast swamp, overgrown with reeds and papyrus ; from this it finally emerges into Lake Huleh. Leaving the southern end of the lake near the Syrian frontier station at Jisr Banat Yacoub, the river flows for some 12 miles in a deep gorge, falling as it does



A sketch-map of the Huleh region.

so from the level of Lake Huleh, which is approximately at sea-level, to that of Lake Tiberias 672 feet below. The region surrounding Lake Huleh is well watered and fertile, and there are in the neighbourhood several Jewish settlements as well as a number of villages of the fellahin. The villages in the immediate proximity to the swamp are, however, unhealthy, owing to the great prevalence of malaria, and they are not as flourishing as the appearance of the country might lead one to expect. Farming appears to be the chief means of livelihood of the inhabitants, and there is a small fishing industry operating in the lake. The papyrus of the swamp is cut and dried by the fellahin of villages near the swamp, the thick stems being used in the building of the huts of the villages, or being sent to other parts of Palestine for the manufacture of mats, chair bottoms, and so on. Water buffalo are kept in most of the villages around the Huleh, swamps; they graze in or near the swamp, and are a striking and unusual feature of the landscape.

The climate (see Table I.) is hot, though not unbearably so, while during the winter months the weather may become unpleasantly cold. Rainfall is normally restricted to autumn and winter.

Lake Huleh itself is some four miles in length and two and a half miles across its greatest breadth ; in shape it is roughly pear-shaped, with the narrow end directed toward the south. In depth it does not exceed seven feet over most of the area, while a great part is less than four feet deep. The bottom is of soft greyish mud, and for the most part is covered with rooted aquatic plants. These reach the surface of the water. The shores are very gently shelving. On the western side the shore line derives its contour from a number of gravel spits which project into the lake, and which alternate with a series of small bays. On the eastern side the appearance of the shore is different, gravel being replaced by basalt blocks. On the eastern side also the vegetation of the surrounding and reaches the waters edge, the small beach which is present on the western shore being very much reduced. In most parts of the shore the gravel and stones are exposed at the waters edge, but in some areas there is a layer of mud and plant debris overlying the gravel. This layer of mud is particularly deep in some of the bays

Table I.—*A Comparison of the Temperature of Lake Huleh (surface) with that of Air (shade).*
in degrees C.—Aug.–Dec. 1935.

Day of the month.	August.				September.				October.				November.				December.			
	Lake.		Air.		Lake.		Air.		Lake.		Air.		Lake.		Air.		Lake.		Air.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1.....	—	—	—	—	—	—	37	20	27	22	31	12	—	—	20	15	—	—	15	11
2.....	—	—	—	—	32·5	26·5	37	19	28	22	35	10	—	—	17	15	—	—	16	12
3.....	—	—	—	—	32	26	35	18	—	—	34	16	—	—	18	14	—	—	20	9
4.....	—	—	38	22	32·5	25·5	34	19	—	—	36	20	—	—	24	12	—	—	23	9
5.....	34	27	36	24	31	25	34	21	—	—	32	17	—	—	24	10	—	—	25	11
6.....	—	—	36	22	31	26	35	20	25·5	23	31	18	—	—	25	12	—	—	23	14
7.....	32·5	26	35·5	19	32	24	36	19	—	—	—	15	—	—	28	15	—	—	23	11
8.....	—	—	35·5	19·5	—	—	36	18	27	21	38	14	—	—	23	15	—	—	23	9
9.....	33	27	35	19·5	32	26	34	17	—	—	32	15	—	—	24	13	—	—	22	11
10.....	—	—	33	21	—	—	36	17	26	23	34	19	—	—	22	12	—	—	22	15
11.....	—	—	33	19	31	26	33	21	26·5	22	31	18	—	—	22	11	15	12	19	10
12.....	32	25·5	33	20	31	25	34	19	26	22	32	19	—	—	22	10	15	12	15	9
13.....	—	—	34	20·5	32	26	34	17	24·5	23	32	16	—	—	23	9·5	17	12	20	9
14.....	32	25·5	35·5	21	31	25	35	18	26	23·5	31	21	—	—	23	9	16	13	16	4
15.....	—	—	34	23	30	24	33	22	—	—	35	19	—	—	24	11	16	12	21	3
16.....	34·5	25	36	18·5	29	25	33	20	26·5	20·5	33	19	18·5	16	25	17	16	12	18	6
17.....	—	—	38	20	30	24	33	18	25	23	36	22	18·5	15·5	20	13	16	12	17	6
18.....	35	26·5	37	20·5	29	25	33	17	24	22·5	35	20	18	16	20	8	15	12	15	8
19.....	—	—	36	25	29	25	32	18	25	25	28	14	19	16	20	7	16	12	18	10
20.....	—	—	36	23	28·5	24	32	17	24	22	30	15	15	15	21	7	16	12	19	13
21.....	—	—	36	20	30	25	33	20	25	22·5	29	15	16·5	15	19	12	16	12	20	6
22.....	34·5	25·5	37	20·5	32	25	35	20	24·5	22·5	28	11	18	15	19	7	—	—	19	7
23.....	—	—	37	20·5	30	24	33	19	23	21	29	12	19	15	20	4	17	12	—	6
24.....	32·5	25·5	35·5	23	30·5	24·5	33	19	25	22	30	12	18	15·5	23	6	—	—	—	—
25.....	—	—	—	—	28·5	23·5	32	17	26	22	32	12	17	13	21	6	—	—	—	—
26.....	33·5	26·5	36	—	—	—	31	21	25	22	30	12	—	—	23	10	16	12	—	—
27.....	—	—	38	21	—	—	31	17	—	—	27	14	17	13	23	10	—	—	—	—
28.....	34·5	27	37	23	—	—	32	16	—	—	26	13	17	13	22	15	—	—	—	—
29.....	—	—	37	19	25	20	28	21	—	—	29	18	17	13	19	13	—	—	—	—
30.....	—	—	36·5	22	25	20	28	15	—	—	27	17	—	—	20	13	—	—	—	—
31.....	34	26	36·5	19	—	—	—	—	—	—	19	16	—	—	—	—	—	—	—	—

on the western side, where such areas have been colonized by reeds, and form small bands of swamp extending down the side of the lake. Running parallel to the shore, at a distance of from ten yards to about a hundred, there is a well-marked bank composed entirely of shells of Mollusca. At the north-west side of the lake this turns away from the shore and encloses twenty acres of cultivated land. During the winter, with the rise in the water-level, this land became flooded. From the shore, gently rising, cultivated land extends westwards to the mountains two or three miles distant; on the eastern side the mountains rise up from within a hundred yards of the shore, and the country is very rough. The lake is fed chiefly by the River Jordan, which enters at the north, but there are in addition several large springs as well as a number of *wadis*. The chief spring on the western side is Ain el Mellaha, while there are two of comparable size on the eastern side. At the northern end of the lake the depth of water is much reduced, as a result of the deposition of a fan-shaped bar of mud extending across most of the lake. This mud, deposited where the swift-flowing Jordan opens into the lake, is colonized by reeds, on the outside of which there is a broad band of water-lilies. Over the greater part of the northern end this colonized mud-bar is but indefinitely divided from the swamp proper, but on the north-eastern side the dividing line between the papyrus and the lake is quite distinct. The Huleh swamp (Ard el Huleh) is some twelve and a half square miles in area, and extends some five miles northwards from the lake, eventually merging into cultivated land. Though much of it is a dense jungle, composed of a pure stand of *Cyperus papyrus*, it is by no means homogeneous, and there are some areas characterized by reeds and tall grasses, others, more or less dry, with a varied fauna of flowering plants, shrubs, etc.; pools several acres in extent, covered with water-lilies; and channels of flowing water. In the drier parts of the swamp the vegetation appears to grow from a more or less rigid "raft," composed of plant debris, bound together by the roots and rhizomes of the papyrus. In places this structure is obviously only loosely bound together, and one may sink deep into a mass of black mud, slime, and water; in others the swamp appears to have dried out, and there is a foot or so of a true black soil, supporting a varied flora. Borings made through the floor of the swamp showed the presence of a gravel bottom at about 14 feet *. At the sides, during the summer, the swamp was clearly delimited from the surrounding country. At the north, however, the limits are not clear, and it seems that the area varies from year to year. This increase in area was very noticeable after the rains, since large areas of country beside the swamp became flooded. The course of the River Jordan has not been recently traced through the swamp, but it is believed that this varies considerably over a period of years. At the north of the swamp the River Jordan divides, but one branch appears to lose itself in the swamp, since this second branch can only be traced a short way. To one who has no experience of such a tract of country Ard el Huleh is unforgettable, the density of the plant-growth and the diversity of its various parts making it most striking and by no means unattractive.

While there is a reference to the Waters of Merom in the Bible, and there are other doubtful and fragmentary pieces of historical evidence, it seems that it was not until the accounts of their journeys by the travellers Cotovicus (1599), Adrichomus (in Quaresmius (1619)), and de la Roque that there is any evidence of biological interest. All these three travellers reported that the lake was susceptible to considerable fluctuations in level and that it dried up in summer. Although this is difficult to believe when one sees the lake as it is to-day, these authors were equally definite on this point, and Adrichomus describes how, instead of crossing the lake, he had to cross a plain of blackish earth, " dry and without a single drop of water." McGregor (1886), in 'The Rob Roy on the Jordan,' gives a good account of the region, and described most entertainingly how he made a journey down the river by canoe, passing through the Huleh swamp. He made interesting freehand maps of the relative extent of papyrus and reeds, and gives a fairly accurate account of the structure of the papyrus swamp. Tristram must have visited Huleh, since he records specimens from the region, but he does not give any general

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* For this information the authors are indebted to the engineers of Messrs. Rendell, Palmer, and Tritton, who were working at Huleh at the time of our visit.

account of the lake or swamp. Annandale also visited Huleh, but he reports that the lake appeared overgrown with weeds and difficult to work satisfactorily. The only complete account of the region remains that of Barrois, previously mentioned, who gives a fauna list, description of the region, and a list of literature. Barrois's fauna list is repeated and brought up to date in Bodenheimer's 'Animal Life in Palestine.'

THE EXPEDITION, OBJECTS AND METHODS.

The headquarters of the Expedition were at the Malaria Research Station of the Hebrew University, at the village of Rosh Pinna, on the high ground not far from the lake. From here journeys were made daily to various parts of the lake and swamp, and as complete a survey was made as was possible with the limited personnel at our disposal. The scope of the work had of necessity to be limited, and a careful study was devoted only to those groups which would appear most likely to afford the greatest amount of information in connection with the zoogeography of the Jordan system. Groups of animals with very wide powers of distribution, such as Diptera or Lepidoptera, were not studied. The survey was also restricted to those parts of the Huleh region which would be altered by the proposed drainage operations, and the River Jordan north of the swamp was not studied, nor were the streams running down to the lake. The investigation of the lake was a straightforward matter, and a general survey of the whole area could be made from the Jewish settlement of Yessud Hamalla; with the swamp, however, it was obviously impracticable to attempt a general survey, since the depth of mud and the density of the papyrus made much of it impassable. It was therefore decided that certain typical areas should be worked out as thoroughly as possible. For this reason, and because there was a navigable channel in the swamp at this point, most of the work was done from the village of Mellaha on the western side. From here visits were made to all parts of the swamp, while it was also possible to collect from the River Jordan. The collections were all taken back to Rosh Pinna, where they were sorted and preserved. For the routine zoological collections a number of different nets were used, most of the heavier work being done with a modified shrimping-net, while for the collection of the smaller pond life a casting net of bolting silk was used. Preservation of the specimens was largely done in alcohol, though a part of the collections was also preserved in formalin. Attempts were made to narcotize Oligochæta and Mollusca, using various agents. In the end it was found better to kill Oligochætes instantaneously with boiling Bouin's solution. Hydracarines were preserved in Könike's fluid. The collections of fishes were obtained from the local fishing industry at Yessud Hamalla, to the manager of which we are very grateful. Plankton hauls were made at regular intervals, using conical nets designed for horizontal towing. It was found impossible to make quantitative plankton hauls owing to the shallowness of the water and to the great amount of vegetation which obstructed the net as it was being towed. Mud samples were taken by means of dredges and also by means of a small Peterson grab.

A most important part of the general survey was the botanical study, which was in the hands of Mr. R. F. Jones. Complete botanical collections were made from the lake, the swamp, and the surrounding country, and the ecology of the swamp was investigated, together with that of the plant associations on the lake bottom.

Besides obtaining information on the flora and fauna, the expedition also carried out a certain number of investigations into the physical and chemical characteristics of the various types of habitat from which specimens were collected. The temperatures of the air and of the lake were recorded at a small meteorological station at Yessud Hamalla, the recorder of which kindly gave us all the information that was needed. In addition temperatures were recorded where necessary at other points in the lake. The oxygen content of waters in the lake and swamp were determined by Alsterberg's (1926) modification of Winkler's method, which is more suitable for waters rich in organic matter than is the unmodified Winkler's method. The pH of the waters was measured colorimetrically, and the alkali reserve was determined by the method of Saunders (1926). In addition to this samples of water from various parts of the region were brought back to England for complete chemical analysis.

The Expedition is most grateful to the many people who gave us valued help. In particular we owe a very great debt of gratitude to Dr. and Mrs. Mer, of the Malaria Research Station, Rosh Pinna, for their hospitality and for the great trouble they took to help us; we are also very grateful to Prof. F. S. Bodenheimer and his staff at the Hebrew University for their hospitality and assistance. Our thanks are also due to Prof. W. Stiles, F.R.S., and Prof. H. Munro Fox, F.R.S., for so kindly giving us leave of absence from Birmingham University, and for much help in other ways, and to Prof. J. Stanley Gardiner, F.R.S. We are indebted to many people for advice; in particular to Dr. W. Leach, Dr. G. S. Carter, Prof. P. A. Buxton, and Dr. W. H. Pearsall, while we acknowledge with thanks the loan of apparatus from the Zoological Department, Cambridge University; Departments of Zoology and Botany, the University of Birmingham; the John Murray Expedition; and the Trustees of the British Museum (Natural History). Finally, we wish to thank all those, in Palestine and at home, who have helped us in so many ways.

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Report on the Flora and Fauna of Lake Huleh.

Part I. The Fauna.

CŒLENTERATA.

Hydra viridis L. has been recorded by Barrois from Lake Huleh. I record a green *Hydra*, which could not be identified, as being not uncommon among the vegetation of the Lake.

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* These references are taken from Barrois's paper, and are not verified.

PORIFERA.

Only one species of sponge was recorded by Barrois, *Ephydatia syriaca* Tops. Mr. H. Burton determines the single specimen I found at Lake Huleh as *Ephydatia fluviatilis* L., subsp. ? Sponges are very rare in Lake Huleh, and the only species that I found was on a small stone near the waters edge.

TURBELLARIA.

Three specimens of a planarian were taken in a small patch of *Phragmites* on the north-western side of the lake ; several specimens in holes in stems of *Polygonum* growing by the side of the Jordan in the swamp, and one specimen esembling *Planaria gonocephala* in the spring Ain El Mellaha. I have unfortunately not been able to find a specialist who will identify these, but I give these notes for the guidance of future collectors.

THE POLYZOA.

By ANNA B. HASTINGS, M.A., Ph.D., Department of Zoology, British Museum (Natural History).

In naming Mr. Washbourn's Polyzoa from Lake Huleh, I have not attempted to determine their relationship to similar forms elsewhere. A revision is very desirable, but much more material than is at my disposal would be necessary.

I am grateful to Miss Z. Waloff for translating relevant passages from the Russian papers.

Species found.

Freshwater Polyzoa from Palestine have been described by Annandale (1913), who found a species of *Plumatella* (*P. auricomis*) and a subspecies of *Fredericella sultana* (subsp. *jordanica*) in the Lake of Tiberias. As Lake Huleh is near the Lake of Tiberias, and connected with it by the Jordan, it was likely that the same forms would be found in Mr. Washbourn's collection. In addition there is in Lake Huleh a second species of *Plumatella* which in the present state of the classification can only be referred to *P. emarginata* Allman. A fourth type of polyzoon was found by Mr. Washbourn on *Polygonum* in the North Jordan (B.M. 1936.6.24.13, 14), but cannot be identified. In external form it resembles typical *Fredericella sultana*, but the shape of the lophophore is unknown and there are no statoblasts.

Distribution of the Species.

All the three identifiable Palestinian forms are known from Russia. *P. emarginata*, whose distribution is reputed to be almost world-wide, is found in Lake Baikal, in the region of Turgai, throughout European Russia except the north (Abrikosov, 1927 *b*, p. 309), and in the Ussurian region of E. Siberia (Abrikosov, 1936, p. 378). The other two forms were recorded by Annandale (1915, pp. 74, 79) from the Volga region. Abrikosov (1927 *b*, p. 308) further records the subspecies of *F. sultana* from East Persia.

Measurement of Statoblasts.

The statoblasts were mounted in balsam. When the balsam was dry it was warmed till soft and the coverslip pressed down so as to hold the statoblasts in the plane of the slide. It is hoped that in this way the risk of inaccuracy in the measurements due to tilting of the statoblasts has been reduced to a minimum. A further source of inaccuracy in the measurement of statoblasts is the want of definiteness in the points on the circumference from which the measurements are made, but in repeated measurements of the same statoblasts the differences in individual measurements did not affect the averages.

DESCRIPTION OF THE SPECIMENS.

Fredericella sultana subsp. *jordanica* Annandale.
(Pl. XVII. figs. A, B.)

Fredericella sultana subsp. *jordanica* Annandale, 1913, p. 228, pl. vii. figs. 1, 1 *a–c*; 1915, p. 74; Behning, 1924, p. 171.
Fredericella jordanica Abrikosov, 1927 *b*, p. 308.

Lake Huleh, Palestine, common on stones along shore, Sept. 1935 (B.M. 1936.6.24.3); and on rooted plants, Nov. 1935 (B.M. 1936.6.24.4, 5).

As in Annandale's subspecies the colonies (Pl. XVII. figs. A, B) consist of recumbent, more or less entangled tubes, erect branches are absent or very short, and the statoblasts are rather elongate. The zoœcia have brittle walls, encrusted with sandy particles, as is usual in *F. sultana*.

The colonies on weed further resemble Annandale's in their very pale colour. The zoœcia are like those in Annandale's figures, but are less markedly keeled.

The specimens from stones are more densely matted, and their zoœcia are slightly narrower and less clearly keeled. The colony has a browner colour, probably owing to differences in the silty material available for deposition on the walls.

A few slightly darker and thicker areas in the ectocyst can be detected in both sets of specimens, but they are very slightly developed. As Annandale only found them " at or near the oldest part of colonies of considerable size " this is not surprising.

Despite the fact that some zoœcia are almost without keel there can, I think, be no doubt that these specimens represent the form described by Annandale. As we have seen, his specimens came from virtually the same locality, and both collectors found the *Fredericella* common on stones round the shore and on plants.

The zoœcia are certainly shorter than is usual in British specimens, but I am not sure that the Palestinian form is even subspecifically distinct from *Fredericella sultana*. Long statoblasts are to be seen in British specimens of *F. sultana*, and Kraepelin (1887, p. 104) also noticed considerable variation in the statoblasts of that species. On the other hand, Abrikosov (1927 *a*, p. 91) was inclined to regard subsp. *jordanica* as a distinct species, a course which he subsequently adopted (1927 *b* and 1936). The whole question of the status of the various forms of *Fredericella* needs reconsideration after the examination of much more material.

Plumatella emarginata Allman. (Pl. XVII. figs. C, D ; text-figs. A–D.)

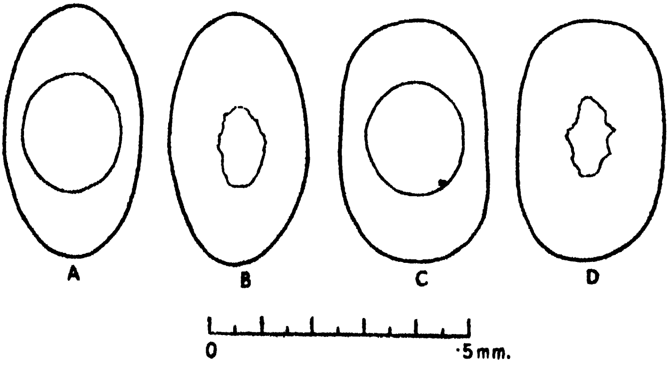
Plumatella emarginata Allman, 1856, p, 104, pl. vii. figs. 5–10 ; Braem, 1890, p. 9, pl. i. figs. 12, 14.

Plumatella princeps var. *α emarginata* Kraepelin, 1887, p. 120, pl. iv. fig. 108, pl. v. fig. 123.

South Jordan, under stones. (Type 1, B.M. 1936.6.24.6; type 2, 1936.6.24.7, 8.)

The material of *P. emarginata*, though collected at one locality, comprises small quantities of material of two types.

In both types the floating statoblasts have the annulus much more extensively developed on one face than the other, the zoœcia are emarginate, and some are obscurely keeled. Their general surface is sandy, but their tips are white and free from sand. The tubes are rather stout, resembling those of Braem's specimen of *P. emarginata* from Oderberg (B.M. 11.12.10.2) and Kraepelin's *P. princeps* [*emarginata*] var. *spongiosa* from the Elbe (B.M. 12.10.17.2)



Outline of two faces of free statoblasts.
A & B, *Plumatella emarginata*, type 1.
C & D, *Plumatella emarginata*, type 2.

Type 1 is represented by two small colonies consisting of matted encrusting tubes with upturned ends (Pl. XVII. fig. C). Both fixed and free statoblasts are present, and their dimensions agree with the measurements of statoblasts of *P. emarginata* given by Kraepelin, Braem, and Harmer.

Five free statoblasts average ·48 × ·27 mm. (standard deviations of measurements, length ·015, breadth ·005).

Ratio. Length : breadth : : 1·8 : 1.

Five fixed statoblasts (capsules) average ·48 × ·36 mm. (standard deviations, length ·062, breadth ·061).

Ratio. Length : breadth : : 1·33 : 1.

The fixed statoblasts are, as usual, much more variable than the free ones, as can be seen from the higher standard deviation of their measurements.

Type 2 is represented by a tangle of erect branches attached here and there to pebbles and small shells, the branches not usually adhering to each other, but occasionally running parallel and adherent. There are no fixed statoblasts. The free statoblasts are shorter and broader than those of type 1, and have straighter sides and blunter ends, which give them a rectangular appearance (*cf.* text-figs. A, B, and C, D).

Eight free statoblasts average ·46 × ·30 mm. (standard deviations, length ·007, breadth ·017).

Ratio. Length : breadth : : 1·53 : 1.

This ratio is the minimum for *P. emarginata* given by Kraepelin (1887, p. 119).

It is difficult to relate these two types of specimens to the described varieties of *P. emarginata*, and, as they were growing together and their zoœcia are very similar, it is possible that they are stages in the growth of a single form. Harmer (1913, p. 451) noticed a difference in the size of the statoblasts in different parts of a single colony of *P. fungosa* var. *coralloides*, but in the present specimens the difference is in shape rather than in size, and statoblasts from the adherent zoœcia of type 2 show no approach to the characters of those from type 1.

Plumatella (*Hyalinella*) *auricomis* Annandale.

Plumatella auricomis Annandale, 1913, p. 227, pl. vii. fig. 2; 1915, p. 79; Behning, 1924, p. 173; Abrikosov, 1927 *b*, p. 308.

Phragmites Swamp, El Almanyia, Palestine, 19. xi. 35 (B.M. 1936.6.24.1, 2).

Annandale described *P. auricomis* as having comparatively few tentacles. The present specimens have between forty and fifty, which, according to the numbers given in Allman's monograph, is not below the average found in Phylactolæmata.

I have not seen the original specimen, but part of the material from the Volga region, identified with *P. auricomis* by Annandale, is in the British Museum (14.6.10.1), and resembles the Huleh specimens in having quite numerous, long tentacles. It seems possible that the full number of tentacles was not visible in the poorly preserved type-specimen.

In other respects the present specimens agree very closely with Annandale's description. They have no statoblasts.

In their general appearance the colonies resemble *P. punctata*, and the compact branches, in which numerous buds have developed with very little elongation of the zoœcia, resemble those frequently found in that species. The two species differ in their ectocyst, which is soft in *P. punctata* and firm in *P. auricomis*, and in the absence in the latter of the white spots which, though not peculiar to *P. punctata*, have given it its name. If the yellow colour of the tentacles of *P. auricomis* is constant this too may be a point of distinction. *P. punctata* being described with white tentacles and yellow gut (Hancock, 1850, p. 200). It is unfortunate that free statoblasts have not been found in material of *P. auricomis* from the type-locality. Those from the Volga region are smaller than those of *P. punctata*, and longer in proportion to their width. The average measurements for the two species, published respectively by Annandale and Braem (1890), are :—

P. auricomis	·314 × ·17 mm.
P. punctata	·47 × ·32 mm.

This gives the ratio of breadth to length as 1 : 1·8 and 1 : 1·47 respectively. The autumn statoblast of *P. punctata* figured by Kraepelin (1887, pl. vii. fig. 153) measures ·6 × ·46 mm.

The Volga specimen agrees with the present colonies in the characters of the ectocyst and polypides, but has relatively elongated branches. The two forms of colony are comparable to those of *Plumatella* (*Hyalinella*) *vaihiriæ* (Hastings, 1929, p. 308, text-figs. 3 A & B). In that instance there were grounds for regarding both forms as phases of a single species. The summer and autumn forms of *P. punctata* described by Kraepelin (1887, p. 127) also afford evidence of such differences within a species.

If *Hyalinella*, type *H. punctata* (Hancock), is to be maintained as a genus or subgenus distinct from *Plumatella*, it is clear that *P. auricomis* should be placed in it.

Behning gives some details of the distribution of this species in the Volga region.

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THE OLIGOCHÆTA.

By Dr. L. ČERNOSVITOV (from the Zoological Institute of the Charles University, Prag).

This paper deals with the Oligochæta collected by Mr. Washbourn and Mr. Jones in 1935 while they were on the Percy Sladen Expedition to Lake Huleh. The rather small number of Oligochæta in the material cannot, unfortunately, contribute much to the solution of the main problems of the Expedition, but the interest is nevertheless considerable, since up to the present time no freshwater Oligochæta are known from Palestine or from Asia Minor.

The zoological investigation of Palestine is still in its early stages. Such data as have accumulated up to the present have been summarized by Bodenheimer (1936) in his 'Animal Life in Palestine.' According to him Palestine may be divided into five zoogeographical zones, based on the distribution of the Vertebrata and of the plant-life. These zones may be called: (i.) Mediterranean, (ii.) Saharo-Sindian, (iii.) Irano-Turanian, (iv.) Euro-Siberian, (v.) Sudano-Deccanian. This method of division may be said to hold for Vertebrata and for Plants, but it cannot be applied without reservation to the Invertebrata, and I need only quote in this connection the work of Rahm (1936) on Tardigrada and of Brehm (1937) on Cladocera. In the latter group of animals, for example, there are only elements of Mediterranean, tropical, and subtropical distribution, while Brehm has recorded no tropical or subtropical elements in the fauna of Lake Huleh.

The following species of Oligochæta have been recorded from Palestine :—

Family **Naididæ.**

Pristina æquiseta Bourne. Known also from Germany, Switzerland, Czechoslovakia, Russia in Europe, and India.

Naidium bilobatum Bretscher. Known also from Switzerland and Germany.

Stephensoniana trivandrana (Aiyer). Known also from S. India (Trivandrum).

Nais pardalis Piguet. Known from Switzerland, Germany, Czechoslovakia, and Peru.

Dero palestinica, sp. n.

Family **Enchytræidæ.**

Enchytræidæ, gen., sp. ? Recorded from Palestine by Stephenson in 1913.

Family **Tubificidæ.**

? *Tubifex* (*Tubifex*) *tubifex* (Müll.). Known also from Europe, Turkestan, India, Illinois, New Zealand.

Tubifex (*Psammoryctes*) *albicola* (Mich.). Known from Germany, Czechoslovakia, Bulgaria, Russia in Europe.

Ilyodrilus orientalis, sp. n.

Limnodrilus hoffmeisteri Clap. Widely distributed in Europe, also from Turkestan.

Family **Criodrilidæ.**

Criodrilus lacuum Hoffm. Recorded from Palestine by Rosa, 1893, and Stephenson, 1913; known also from Germany, Jugoslavia, Czechoslovakia, Italy, Austria, Hungary, South Russia, Syria, India (from Lake Chilka).

Family **Lumbricidæ.**

Eiseniella tetrædra (Sav.) f. *typica*. Nearly cosmopolitan; recorded from Palestine by Rosa (1893).

Eiseniella tetrædra (Sav.) mut. *ninnii* (Rosa). Also from Syria, Italy, California ; recorded from Palestine by Rosa (1893).

Eiseniella tetrædra (Sav.) var. *sewelli* Steph. Endemic to Palestine ; recorded by Stephenson (1913).

Eisenia rosea (Sav.). Cosmopolitan ; recorded from Palestine by Rosa (1893).

Eisenia veneta (Rosa). South Europe, recorded from Palestine by Rosa (1893).

Dendrobæna lacustris (Steph.). Endemic ; Stephenson (1913).

Dendrobæna semitica (Rosa). Endemic ; Rosa (1893).

Dendrobæna ganglbaueri (Rosa) var. *byblica* (Rosa). Also from Syria, Crete, Jugoslavia, Bulgaria ; recorded from Palestine by Rosa (1893).

Dendrobæna samarigera (Rosa). Endemic ; Rosa (1893).

Allolobophora caliginosa (Sav.). Cosmopolitan ; recorded from Palestine by Rosa (1893).

Allolobophora jussyensis Mich. Also from Rumania, Switzerland, South Russia, Cauacasus, western Tian-Shan, N. India, Egypt ; recorded from Palestine by Rosa (1893).

Allolobophora aharonii Steph. Endemic ; Stephenson (1913).

Allolobophora georgii Mich. Syria, Spain, Ireland ; recorded from Palestine by Rosa (1893).

Eophila patriarchalis (Rosa). Syria ; recorded from Palestine by Rosa (1893).

To complete this list we may mention also certain species of Lumbricidæ which, though known from Syria, have not yet been recorded from Palestine. They may, however, belong to the Palestinian fauna :—

Eisenia alpina (Rosa) f. *typica*. Known from Italy, Switzerland, Czechoslovakia, Crete, Jugoslavia ; recorded from Syria by Rosa (1893).

Eisenia veneta (Rosa) var. *kervellei* Mich. Endemic ; Michaelsen (1910, 1926).

Dendrobæna semitica (Rosa) var. *kervellei* Mich. Endemic ; Michaelsen (1910, 1926).

Dendrobæna fedschenkoi (Mich.). Also from Turkestan ; recorded from Syria by Michaelsen (1910, 1926).

Allolobophora chlorotica (Sav.). Nearly cosmopolitan ; recorded from Syria by Michaelsen (1910, 1926).

Octolasium complanatum (Dug.). Mediterranean; recorded from Syria by Rosa (1893)

Owing to the small number of Oligochæta hitherto recorded from Palestine we cannot make a serious zoogeographical analysis of this part of the fauna, although certain elements can be recognized among the species listed above. These species can be classified as follows :—

(i.) Cosmopolitan species.

These are about six in number, and are all of Holarctic affinity. They belong to the families Naididæ, Tubificidæ, and Lumbricidæ.

(ii.) Endemic species.

Eight in number. We do not yet know whether these are really endemic, or whether they should be classed as Irano-Turanian intrusions into the Palestinian fauna.

(iii.) Palæarctic species.

About eight species, more or less widely distributed in the Palæarctic region. Most of them are Euro-Siberian intrusions into the fauna of Palestine. *Dendrobæna ganglbaueri* (Rosa) var. *byblica* may be regarded as Mediterranean. Two of the species recorded from Syria and not from Palestine (*Eisenia alpina* (Rosa) and *Octolasium complanatum* Dug.) belong to this group.

(iv.) Species showing Oriental relationships.

Examples of this part of the fauna are :—*Criodrilus lacuum* Hoffm. and *Stephensoniana trivandrana* (Aiyer).

None of the species recorded up to the present shows any relationships with the species of the Ethiopian (Palæotropical) region, and no tropical or subtropical species have yet been recorded from Palestine.

Analysis of the Collections made by the Percy Sladen Expedition.

The following ten species were found by the Expedition in Lake Huleh :—

Family Naididæ.

Pristina æquiseta Bourne.

One specimen from the zone of water-lilies at the northern end of Lake Huleh.

Naidium bilobatum Bretscher.

One specimen from mud at the bottom of the Lake.

Bretscher's original description of this species is incomplete; I therefore give some details of this specimen, which, after studying, I refer to *N. bilobatum*.

Length of single specimen 4 mm.; diameter of body 0·3 mm.; number of segments 34. Prostomium short, rounded. Ventral bundles with three to four curved setæ, of which the prongs are approximately equal, length of setæ creasing gradually: in segment ii. 70 μ, in segment iii. to 88 μ, and in segments viii. to x. to about 90 μ. The dorsal bundles consist of two to three unornamented hair-setæ and two double-pronged needles with small equal prongs. The length of the hair-setæ is approximately the same in all segments—that is, equal to the diameter of the body or a little longer than it. The intestine is enlarged in segment viii. Chlorogogen cells begin in segment vi.

STEPHENSONIANA, gen. nov.

Under the name *Naidium* (?) *trivandranum*, Aiyer (1926) described from India a new species belonging to the family Naididæ. In 1929 this species was placed by the same author into a new genus *Stephensonia*. This genus was also used by Stephenson in his 'Monograph of Oligochæta' (1930). The name *Stephensonia*, however, has been used before for Rhynchota (Aphidæ) (B. Dar, Mem. Ind. Mus. vol. vi. p. 175, 1918), and this usage has priority. I therefore propose that, according to the Rules of Nomenclature, the name *Stephensoniana* mihi replace the name *Stephensonia* Aiyer, 1929 (non B. Dar, 1918 in Rhynchota).

Stephensoniana trivandrana (Aiyer).

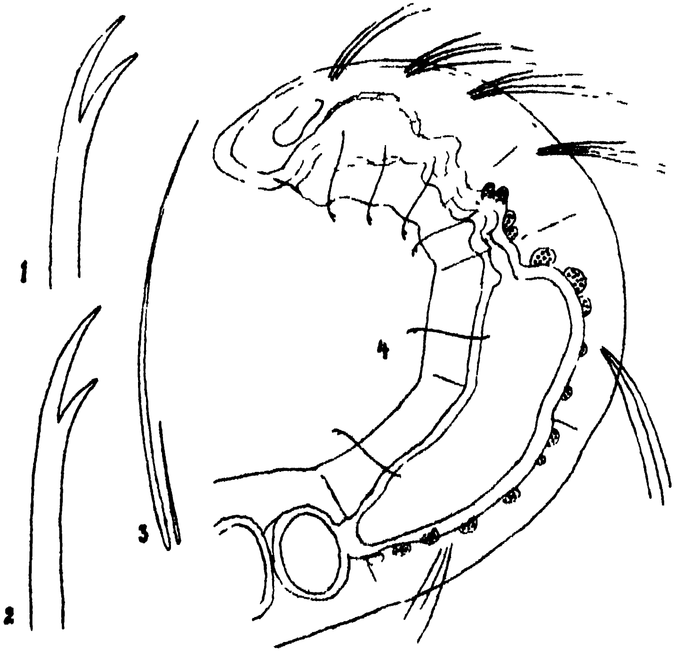
(Text-figs. 1–4.)

Seven specimens found in mud at the edge of Lake Huleh.

Since the first discovery of this species in Trivandrum, it has not been recorded from any other localities. The specimens I studied from Palestine differ slightly from the original description of the species by Aiyer, but the difference is not enough to cause them to rank as new species, or even as a new variety of the Indian species. The description of these specimens is as follows:—

Length of chain (composed of two zooids) about 2 to 2½ mm. Number of segments of first zooid $n=13$;

diameter of body in anterior region 160–190 μ. Prostomium (fig. 4) short, rounded on top, triangular in shape. No eyes. The anterior segments from ii. to iv. are short, their length being less than the diameter of the body. From segment v. posteriorly the segments are considerably longer than the diameter of the body. In some individuals the body-wall is annulated. Aiyer has described that in living specimens of this species there may be circular rows of foreign particles adhering to the skin in a mucilaginous secretion. I did not observe these in the preserved specimens. Pharynx ovoid, situated in segments ii. and halfway into iii. Œsophagus narrow, covered with chlorogogen cells from segment v. In the first third of segment vi. the œsophagus passes suddenly into the enlarged intestine. In contracted preserved specimens the intestine has a large dilation which occupies segments vi. and vii. (fig. 4). In other specimens there is no evidence of intestinal enlargement, but the abrupt



Stephensoniana trivandrana (Aiyer).

change from the œsophagus into the intestine is well marked. This is also figured by Aiyer (1926, p. 6, fig. 3). Both ventral and dorsal setæ begin in segment ii. The ventral bundles consist of curved, double-pronged setæ. In the first five segments these are four to each bundle, this number being reduced to three in the middle of the body and to two or one in the posterior end. In the anterior bundles the outer prongs of the setæ are a little longer than the inner prongs (fig. 1): in bundles in the remainder of the body the outer prongs are twice as long as the inner (fig. 2). In one specimen measured the length of the ventral setæ was 80 μ in segment ii., 72 μ in segment iii., and 67 μ in the remainder of the body. The dorsal bundles are composed of needles and hair-setæ (fig. 3). They consist (in segments iv. and v.) of four, or more rarely five, unornamented hair-setæ, which are 120 to 140 μ in length. In the remainder of the body the needles are two, three, or more rarely four to each bundle. They are about 46 to 50 μ in length, straight, sharply pointed, and they suddenly taper at the distal end.

The species described above differs from those described from India in the number of segments in the first zooid. According to Aiyer this should be twenty ; in the Palestinian specimens it is thirteen. We cannot attach any great importance to this difference, as among the Naididæ the number may vary considerably. According to Aiyer also, the length of the prongs of the ventral setæ should be the same throughout the body, whereas in the Palestinian specimens a small difference may be seen between those of the anterior and those of the posterior parts of the body. In spite of these small differences, the complete coincidence in all other characters permits us to regard the Palestinian worms as being *S. trivandrana*.

Nais pardalis Piguet.

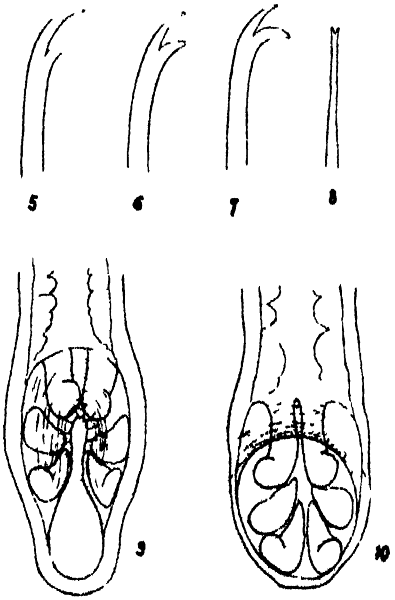
One specimen from the water-lily zone, among roots, Lake Huleh.

Dero palestinica, sp. n.

(Text-figs. 5–10.)

Three specimens, two from among *Ceratophyllum* at the side of a flowing channel in the Huleh swamp, one from flood-water at the eastern edge of the swamp. Mud living.

Length of single individuals 3 to 4 mm.; diameter of body about 150 μ. Number of segments 45, the branchial region unsegmented. Anterior part of the body slightly swollen, prostomium short, rounded. No eyes. The dorsal setæ begin in segment vi.; they consist of one unornamented, straight hair-seta and one needle-seta to each bundle. The needles are straight, 42 to 44 μ in length; they have an indistinct nodulus and their outer ends are bifid, with minute equal prongs (fig. 8). The hair-setæ are equal to, or a little shorter than, the diameter of the body. The ventral bundles begin in segment ii.; they consist of from two to four curved setæ with distinct noduli. The setæ of segments ii. to v. are 64 μ to 66 μ in length, the outer prong is longer than the inner, but at the base they are both the same diameter (fig. 5). In the middle of the body this difference in the length of the prongs is not so well marked (fig. 6), while at the posterior end the condition is reversed and the inner prong is longer than the outer (fig. 7). Chlorogogen cells



Dero palestinica, sp. n.

begin in segment viii. There is no dilation of the gut into a stomach, and the œsophagus merges gradually into the intestine. The branchial region is conspicuous and enlarged. According to the state of contraction of the worm the anterior margin of the branchial fossa may either be concave (fig. 10) or it may form a longitudinal slit, without outgrowths or incisions (fig. 9). There are three pairs of true gills and no secondary gills. The first pair of gills, which is perhaps the longest, arises from the anterior wall of the branchial diverticulum, while the second and third pairs arise from its floor In the preserved specimens the gills are all rather finger-shaped, with swollen external ends. The genitalia and the methods of asexual reproduction were not observed in the three specimens studied. This new species is closely related to *Dero niveum* Aiyer, which is known from India (Trivandrum). The difference in size of the ventral setæ, the fact that the chlorogogen cells begin in segment vii. (and not in segment vi. as in *D. niveum*), the gradual enlargement of the œsophagus into the intestine, without any stomachic dilation, all permit us to regard it as a new species.

NAIDIDÆ, gen., sp. ?

I could only study one anterior and one posterior end of two very badly preserved specimens, which were taken in a plankton-net in the River Jordan. They may be nearly related to *Stylara*, but they show many features which are not known in representatives of this genus. Unfortunately the incompleteness of the material does not permit us to describe these interesting worms further.

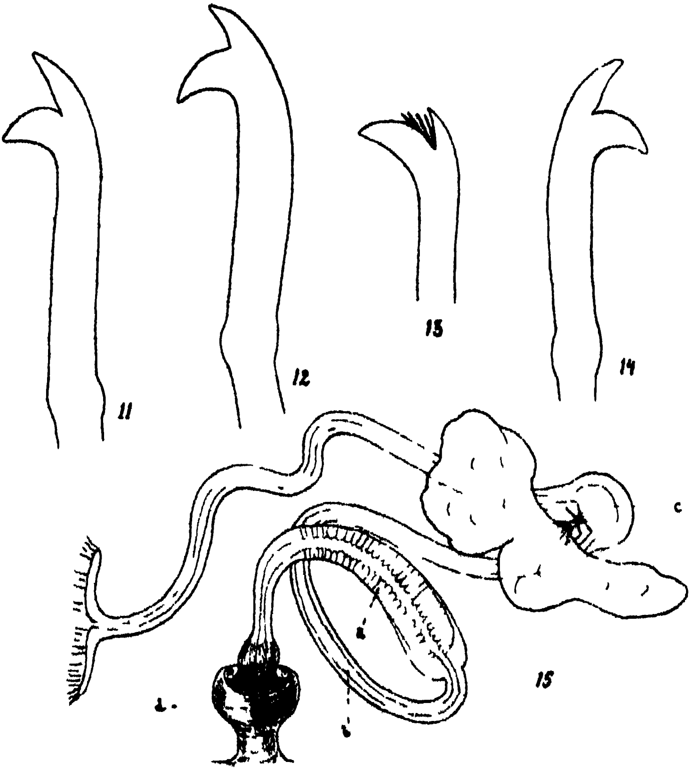
Family **Tubificidæ.**

? *Tubifex* (*Tubifex*) *tubifex* (Mull.).

One immature specimen from a sieving of mud at at the extreme edge of the Lake. From the shape and number of the setæ this may be placed in this species.

Tubifex (*Psammoryctes*) *albicola* (Mich.).
(Text-figs. 11–15.)

Of this species I was able to study a large number of immature specimens and a few mature ones. It is known at the present time from Germany, Denmark, Czechoslovakia, Bulgaria; it is widely distributed in western Russia (goub. Novgorod, River Oka, Kama, Dniepr, Lake Pleshchejevo, and from Chalkar in the Ural district). At Lake Huleh it occurred in mud at the bottom of the Lake, from the very shallow littoral region, and was also found in mud in the papyrus-swamp. From the number of different localities from which it was recorded, and from the number of specimens, it appears that this species, with *Ilyodrilus orientalis*, described below, was one of the most abundant of the Tubificidæ from this region.



Tubifex (Psammoryctes) albicola (Mich.).

I studied the male efferent apparatus of these specimens by means of a series of microscopic sections (see fig. 15). In structure the male organs differ slightly from those figured by Michaelsen (1903, pl. fig. 6), who undoubtedly based his figure on a free hand dissection. In the Palestinian individuals the efferent duct is differentiated into two parts—a large glandular part (fig. 15, *a*), perhaps the proper atrium, and a long tube (fig. 15 *b*), which consists of a prolongation from the atrium and which opens into an ovoid chamber (fig. 15, *c*) ; into this the prostate is inserted. The proximal end of the atrial part ends in the long pointed penis (fig. 15, *d*), lying in a large rounded penial chamber. The structure described for the male genital apparatus corresponds exactly to that described by Hrabe (1931) for *Tubifex* (*Psammoryctes*) *ochridanus* and *Tubifex* (*Psammoryctes*) *oligosetosus*. The spermathecæ reach segment xiii. The large ampulla is distinctly marked off from its short, thin duct, the latter being about 70 μ in diameter. W. Michaelsen (1903, pl. fig. 7) figures the gradation between these two parts as being more gradual, but his specimens may not have been fully mature.

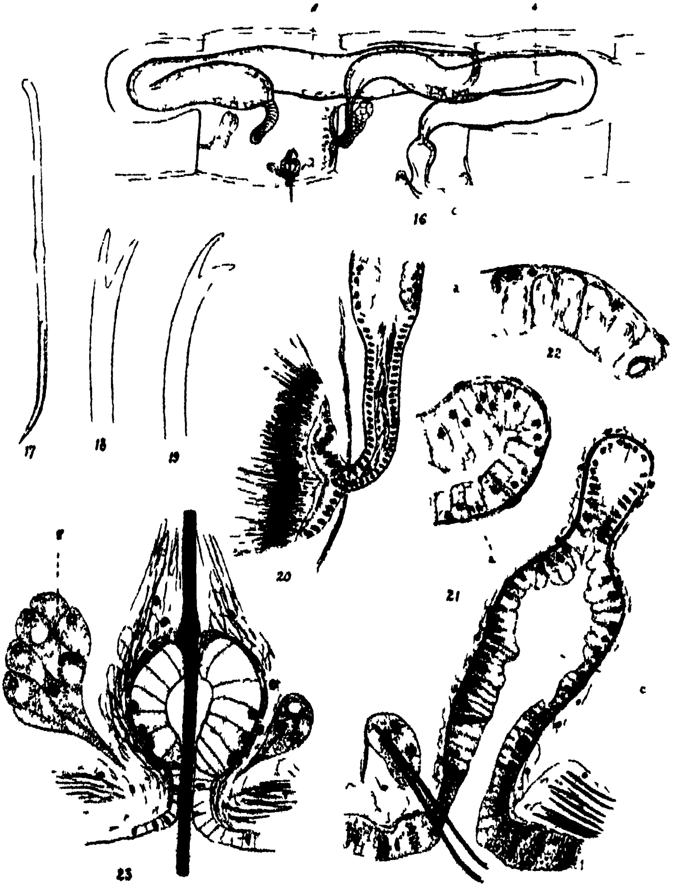
I have figured the ventral setæ of segments eight and forty-three (figs. 11 and 12)and the dorsal setæ of segments nine and forty-three (figs. 13 and 14).

Ilyodrilus orientalis, sp. n. (Text-figs. 16–23.)

Very common in the muddy bottom of Lake Huleh. Many mature and a few immature specimens.

Length of the individuals (preserved in alcohol) 6 to 10 mm., diameter of body at the anterior end 0·4 mm. ; tapers to the posterior end, where it is much thinner (only about 0·18 to 0·20 mm. in diameter). Number of segments in mature individuals 120 to 150. Prostomium short, pointed. The segments ii. to iv. are divided by a secondary groove into two unequal rings ; in the posterior region the segments are very narrow, the diameter of the body being four to five times as great as the length of each segment. Both ventral and dorsal bundles begin in segment ii. ; they consist of sigmoid, double-pronged setæ, each with a small distinct nodulus. The ventral bundles are formed, in the anterior segments, of four or five setæ, each of these is approximately 140–150 μ long and the outer prong is a little longer and thinner than the inner (fig. 19). In the posterior segments each bundle consists of two or three setæ ; these are 80 to 90 μ in length, thinner than those of the anterior bundles, and the inner prongs are a little thicker and longer than the outer. The anterior dorsal bundles consist of from four to five straight, unornamented, hair-setæ, about 410 to 480 μ long. In addition, in each bundle in this region there are four or five double-pronged setæ, about 90 to 105 μ long. These have equally pointed prongs without intermediar teeth (fig. 18). The posterior dorsal bundles consist of two to three pronged setæ, and usually one hair-seta; the length of these is 80 to 90 μ. Œsophagus narrow, passing suddenly into the enlarged intestine behind the dissepiment between segments vii. and viii. There is a further considerable enlargement of the intestine behind the dissepiment of segments xi./xii. Chlorogogen cells begin in segment vi. Blood-vessels very wide.

Clitellum occupies segments x. and xi.; in the specimens examined this was but little developed. Male genital orifice big, situated in segment xi. a little laterally to the line of the ventral setæ. Spermathecal pores are situated in segment x., in the lateral line between the dorsal and ventral setæ. One pair of testes, which are situated in the posterior face of the septum between segments ix. and x. One pair of ovaries in the corresponding position between segments x. and xi. The anterior sperm-sacs are formed by the septum ix./x, and occupy segment ix. The posterior sperm-sacs are formed as a backward pouching of the septum x./xi., and they extend as far back as septum xiv./xv. The ovisacs are formed by the septum xi./xii., and also extend back as far as the septum xiv./xv. In one of the specimens I examined, these contained eggs which were in the first stage of maturation. I was able to count eighteen chromosomes in the equatorial plate. The large male funnels (fig. 20) are situated in segment x., in front of the posterior septum. They are about 120 μ in diameter, and bundles of ripe spermatozoa are to be seen at the mouths. The vas deferens is very short, thick, and is ciliated internally. It is 30 μ wide and only 120 to 140 μ long; it passes abruptly into the atrium, which is very long, tubular and enlarged (figs. 16, *a*, and 20, *a*). The front part of the atrium is composed of very low, well-stained cells (fig. 20, *a*). In other parts of the atrium the cells are very tall, with rounded inner ends, filled with granules of secretion (fig. 21, *a*). Posteriorly the atrium narrows considerably and is only 20 μ in diameter. From this narrow, posterior end there rises a large efferent chamber (fig. 21, *c*). This is about 80 μ in diameter, and is composed of columnar cells, which differ considerably from those of the atrium. Penis and prostate are absent.



Ilyodrilus orientalis, sp. n.

The one pair of male funnels and ducts is situated ventrally in the intersegmental furrow of segments xi /xii. Spermathecæ are composed of a short thin duct, which is clearly demarcated from the remaining portion, the large, tubular ampulla. The duct is only 22 μ in diameter (fig. 16, *s*). The spermathecæ project forward into the anterior sperm-sac and backward into the posterior sperm-sac, extending backward as far as segments xiii. or xiv. (fig. 16). The ampullæ of the spermathecæ contain a large number of spermatozeugms and free spermatozoa. The wall of the ampullæ are composed of a single layer of columnar cells, with large clear vacuoles, occupying the greater part of the cells. In two individuals, examined in microscopic sections, the vacuoles of these cells contained a large number of coiled spermatozoa, which also penetrated into the plasmatic body of the cells (fig. 22). The spermatozoa showed different stages of resorbtion. This phenomenon, the resorbtion of spermatozoa, is widely distributed among the Oligochæta, and has been described by the author in a great number of species (Černosvitov, 1930). It occurs in the spermathecæ of Enchytræidæ, Branchiobdellidæ, Lumbriculidæ, and in many Terricola, but this is the first time that it has been recorded in the Tubificidæ. The ventral setæ of segment x. are modified into spermathecal genital setæ, and of these there is one to each side. These setæ (fig. 17) are about 140 μ long, nearly straight, slightly curved at each end, and have a small nodulus. The external end is hollowed out over the last third of its length, as is the case in many other species of *Ilyodrilus*. It is tapering and sharp pointed. Each spermathecal genital seta arises from a conspicuous ovoid or round gland, through the central lumen of which passes the seta. The setal gland is 60 μ in height and 46 μ wide across the middle; it is composed of a single layer of large, radially disposed cells, with a fine granular cytoplasm. In connection with the gland there are conspicuous lobed masses of large, pear-shaped, glandular cells, each of which has a single large vacuole (fig. 23, *g*). There are no penial setæ.

This new species, described above, is closely related to *I. bavaricus* Oschm., but it differs from the latter in the shape of the dorsal setæ and of the spermathecal setæ. The penis, present in *I. bavaricus*, is absent in *I. orientalis*.

Limnodrilus hoffmeisteri Clap.

Three specimens, from mud in the littoral region of Lake Huleh.

I only had the opportunity of examining one fully mature specimen. In this the penial tubes were about 370 μ long and 32 μ wide at their inner ends (length-width ratio 11 : 1). The other characters corresponded exactly with those of European specimens of this species which I have previously studied.

Limnodrilus sp.

Several immature specimens from mud in Lake Huleh. These could not be accurately determined.

Tubificidæ ?

Several fragments and immature specimens. One from Ain el Mellaha was 7 mm. long and only 100 μ in diameter. From the shape and number of the setæ and from all the appearance of the worm it is apparently nearly related to *Tubifex ignotus* Štolc, but exact determination is only possible with mature specimens.

Family **Criodrilidæ**.

Criodrilus lacuum Hoffm.

The common Oligochæte in the mud around the roots of papyrus in the Huleh swamp; also found in the mud in the *Phragmites* swamp on the western side of Lake Huleh, among the debris of the water-lily zone.

All the specimens were immature, but I have no doubt that they are *C. lacuum*, a species which has been previously recorded from Palestine and Syria (Stephenson, 1913, from Lake Tiberias, and Michaelsen, 1926, from the river Barada, Oasis of Damascus).

Family **Lumbricidæ**.

Eiseniella tetrædra (Sav.) mut. *ninnii* (Rosa).

Several specimens. This species was common in the ground of the papyrus swamp, particularly in the drier areas. It was also found in the areas of *Phragmites* at the sides of the Lake.

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CRUSTACEA ; MALACOSTRACA.

From Notes by Dr. I. GORDON, British Museum (Natural History).

Order DECAPODA.

Potamon (*Potamon*) *potamios* Olivier. Known from Egypt, Palestine, Syria, Mesopotamia, Cyprus. Common in the Huleh swamp.

Atyæphyra desmaresti Millet. Known from Morocco, Algiers, Tunis, Syria, Turkey, Corsica, Portugal, France. Very common in Lake and in swamp.

Order ISOPODA.

Asellus coxalis Dollfuss. Known from Suez, Syria, Palestine, and Cyreniaca. Common in *Phragmites* swamp at west of Lake. Found once under a stone in the Lake.

Metoponothus pruinosus Brandt. Cosmopolitan. Found occasionally in Huleh swamp.

Order AMPHIPODA.

Gammarus pungens H. M. Edw. Known from Italy, Sicily, Cyprus, Syria, Palestine. From Lake Huleh and

Orchestia bottæ H. M. Edw. Known from the Black Sea, Palestine, Cyprus, Holland, and France. An amphibious form, common in moist soil in the drier parts of the Huleh swamp.

None of the species listed above can be said to have Ethiopian affinity, but *Metoponothus pruinosus* Brandt appears to be an addition to the number of Isopoda known from Lake Huleh.

CRUSTACEA; COPEPODA.

From Notes by Dr. J. P. Harding, British Museum (Natural History).

Macrocyclops albidus (Jardine). Distribution: North and South America, Iraq, Java, and Australia. Found in Lake Huleh in most swamp and lake stations.

Eucyclops agilis (Koch) (=*Cyclops serratulus* (Fischer)). Cosmopolitan. Found in Lake Huleh in most swamp and lake stations.

Eucyclops gibsoni (Brady). East and South Africa Found in the littoral region and in flooded land on the eastern side of the swamp

Cyclops prasinus (Fischer) (*Leptocyclops prasinus* (Sars.)). Nearly cosmopolitan. Found in most swamp and lake stations.

Paracyclops fimbriatus (Fischer) (*Platycyclops fimbriatus* Sars). Nearly cosmopolitan. Found in most swamp and lake stations.

Ectocyclops phaleratus (Koch) (*Platycyclops phaleratus* Sars). Nearly cosmopolitan. Found in most lake and swamp stations.

Cyclops viridis (Jurine). Nearly cosmopolitan. Most lake and swamp stations.

Cyclops bicuspidatus (Claus.). Nearly cosmopolitan. Found in the swamp.

Cyclops varicans (Sars). Nearly cosmopolitan. Nearly all swamp and lake stations.

Mesocyclops leukarti (Claus). Nearly cosmopolitan.

All save one of the copepods recorded above are cosmopolitan; the exception, *Eucyclops gibsoni* (Brady) would seem to be of Ethiopian affinity. Of the remainder, *C. varicans* (Sars), *E. agilis* (Koch) and *C. leukarti* have been recorded from Lake Tiberias, *E. agilis* being recorded from Huleh as well. The remainder are not mentioned in Bodenheimer's lists, and appear to be fresh records for the country.

THE MOLLUSCA.

By G. I. Crawford, British Museum (Natural History).

The collection of Mollusca made by Mr. Washbourn in Lake Huleh contains the seventeen species listed below.

Class **GASTROPODA.**

Order Mesogastropoda.

Theodoxus jordani (Sowerby). Common in all parts of the Lake except the *Phragmites* swamp along the north-west edge.

Theodoxus macrii (Sowerby). In the spring at Ain el Melaha, under stones.

Valvata saulcyi Bourguignat. Common in the Huleh swamp and in all parts of the Lake, in weed or mud.

Bithinella galilaeæ (Preston). Six specimens in mud, Lake Huleh.

Bithynia sidonensis Mousson. Common in Lake and Huleh swamp.

Melanopsis costata (Olivier). Common in Lake Huleh, including the littoral region.

Melanopsis præmorsa (Linn.). Common in the Huleh swamp and in the littoral region of the Lake.

Order Basommatophora.

Limnæa lagotis Schrank. One specimen dredged from mud in Lake. Several empty shells in Huleh swamp.

Limnæa palustris (Müller). Common in the Huleh papyrus swamp, and in the areas of *Phragmites* along the side of the Lake.

Planorbis hebraicus Bourguignat. Five specimens among *Phragmites* and weed, Lake Huleh.

Planorbis planorbis (Linn.). Six specimens from Huleh swamp.

Bullinus truncatus (Audouin). Three juvenile specimens from the *Phragmites* swamp, north-western side of Lake Huleh.

Ancylus lacustris (Linn.). Not uncommon in swamps, also along the River Jordan,

Order STYLOMMATOPHORA.

Succinea pfeifferi Rossmaessler. Five specimens from Huleh swamp.

Class **LAMELLIBRANCHIA.**

Unio terminalis Bourguignat. Not common in the mud at the bottom of Lake Huleh.

Sphærium lacustre (Müller). Common in *Phragmites* swamp, Lake Huleh.

Corbicula fluminalis (Müller). Rare; one specimen from mud, Lake Huleh.

Seven of these species are additions to Bodenheimer's list of Mollusca from Lake Huleh (1935, p. 416), and four are new records for the Jordan valley:—

Valvata saulcyi, previously known from Lake Tiberias and from numerous localities in Syria.

Bithinella galilaeæ, previously recorded only from Lake Tiberias by Preston (1913, p. 470, pl. xxvii. fig. 5). Washbourn's shells agree in sculpture and form with a paratype of Preston's in the British Museum, but they are slightly more elongate. The dimensions (length and major diameter) of four specimens are 5·2, 2·0; 4·8, 1·9; 5·1, 2·1; 4·3, 1·8 millimetres. Preston gives 3·75 and "2 mm. (nearly)" as the dimensions of his type, but his figure shows it to be more than twice as long as broad, and the paratype referred to above measures 4·4 by 1·9 mm. *B. contempta* Dautzenberg (1894, p. 348, fig. 3), from Lake Huleh, seems to differ from *B. galilaeæ* only in form. The dimensions of the type are 3·3 and 1·7 mm. according to Dautzenberg, but he observes that slenderer and stouter specimens were found.

Limnæa palustris, not previously recorded from the Jordan Valley. Its range covers whole of Europe; Siberia, Transcaucasia, Persia, Syria, Asia Minor; Morocco, Algeria, and Tripoli.

Planorbis planorbis, not previously recorded from the Jordan Valley. Its range is nearly the same as that of *Limnæa palustris*.

Bullinus truncatus, recorded from Lake Tiberias by Preston (1913) as *Physa tiberiadensis* (see Annandale, 1922), and from Syria by Germain (vol. i. p. 428, pl. xvi. figs. 9, 10) as *B asiaticus*. Annandale (1918, 1922) gives a comprehensive synonymy of this species, and shows that it inhabits most of the Mediterranean seaboards and Africa as far south as Natal and the tropical west coast.

Succinea pfeifferi, not previously recorded from the Jordan Valley, but known from Syria under the names *S pfeifferi* and *S. indica* Pfeiffer (Germain, 1921–2, vol. i. pp. 378, 379). Rao (1924) found no constant differences in the shells, jaws, radulæ, or reproductive systems of these two so-called species.

Bodenheimer (1935, pp. 382, 448) states that *S. elegans* is present in Palestine ; he follows Germain in regarding *S. indica* as a variety of *S. elegans*. This species, as Quick (1933) points out, is with difficulty distinguished from *S. pfeifferi*, except by examination of the reproductive systems. Dissection shows Washbourn's specimen to be *S. pfeifferi*, and it is impossible to be sure that *S. elegans* is present in Palestine until the identification is checked by dissection. The range of both species extends as far north as England, and so neither can be said to represent a tropical element in the fauna of Palestine, as Bodenheimer (1935, p. 382) claims.

Sphærium lacustre, not previously recorded from the Jordan Valley and only tentatively from Syria by Dautzenberg (1894, p. 352). This species is found throughout Europe. Dr. C. Boettger of Berlin kindly verified my identification.

Bodenheimer's list (p. 416) of Mollusca from Lake Huleh contains the following seven species not collected by Washbourn (there are thus twenty-four species of Mollusca known at present from the Lake):—

Bithinella contempta Dautzenberg.
Bithynia hawadierana Bourguignat.
—— *badiella* Kuester.
—— *elæca* Bourguignat.
Melanopsis saulcyi Bourguignat.
Limnæa truncatula (Müller).
Psilunio semirugatus (Lamarck).

It is possible that *Succinea globosa*, described by Tristram (1865) as a new species from specimens from Lake Huleh, will be shown to be an addition to these lists. The name must be discarded, for, as Peile (1936) points out, the type selected by Tristram for description is a specimen of *Limnæa lagotis*. Boxed with the type, however, Peile found the shell of a *Succinea* resembling *S. putris* (Linn.) or *S. kervillei* (Germain, 1921–2, vol. i. pp. 379, 380, pl. xxi, fig. 28), and almost certainly not a specimen of *S. pfeifferi*. It should be noted that the dimensions given by Germain on p. 380 for *S. kervillei* are far from agreeing with his figure.

Annandale (1916, p. 461) described the mollusc fauna of Lake Tiberias as mainly Palæarctic, containing also a large proportion of endemic Syrian species and a small tropical element which was as much Oriental as Ethiopian. Recent reduction of certain species to synonymy, and increased knowledge of the distribution of others, has diminished the number of species which can be considered endemic, but with this reservation his conclusions still apply to the known mollusc fauna of the whole Jordan Valley.

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TRISTRAM, 1865. " . . . Mollusca of Palestine." Proc. Zool. Soc. London, 1865, pp. 530–545.

THE FISHES.

From Notes by Mr. J. R. NORMAN and Miss E. TREWAVAS, British Museum (Natural History).

I record the following species of fish from Lake Huleh :—

Family Cyprinidæ.

Barbus longiceps Cuv. & Val. Known also from Syria and Palestine (Galilee and Huleh).

Barbus canis Cuv. & Val. Known from Palestine (Galilee and Huleh), Syria, and Transjordan.

Varicorhinus damascinus (Cuv. & Val.). Known from Syria, Palestine, and Asia Minor.

Alburnus sellal Heck. Known from Iraq, Syria, etc.

Phoxinellys (? *kervillei* Pellegrin). Known from River Orontes.

Family **Clariidæ**.

Clarias lazera Cuv. & Val. Known from Syria, R. Nile, R. Congo, Senegal.

Family **Cyprinodontidæ**.

Lebias cypris Heckel. Known from Syria, Palestine (Huleh, Galilee, etc.).

Family **Cichlidæ**.

Tilapia galilæa (Artedi). Known from Palestine (Galilee, Huleh, Jordan), Nile, Senegal, Gambia, Portuguese Guinea, Lagos, Niger.

Tilapia nilotica (L.). Known from L. Galilee and R. Jordan southwards to East Africa, the Upper Congo, and Lake Tanganyika, westwards through the Chad Basin to the Senegal and Niger rivers.

Tilapia zillii (Gerv.). Known from Lake Galilee, the Algerian Sahara, and Lower Egypt to the Bahr-el-Gebel, the Victoria, Nile, Lakes Rudolf and Gandjule, the Chad Basin, the Niger, and the Gold Coast.

To this list we may add the following species, previously recorded from Lake Huleh, but which were not represented in our collections :—

Haplochromis flavii-josephi (Lortet). A spring-inhabiting species, known from the Jordan below Huleh.

Tilapia simonis (Gunther).

Varicorhinus socialis (Heckel).

Acanthobrama centisquama Heckel.

Cyprinodom dispar Rüppell.

Tilapia magdalenæ (Lortet.).

The zoogeographical relations of the fish fauna of Huleh appear to be well established. The Cyprinidæ and

Cyprinodontidæ are of European or Asiatic affinity, while the Cichlidæ are clearly Ethiopian (Sudano-Deccan). The three species of Cichlids represented in our collections are three commonly found in the River Nile, while those recorded from Huleh by others are endemic, though they are obviously very nearly related to the Nilotic species. The Clariid is an African species of an African and Asiatic genus.

REPTILES AND AMPHIBIANS.

By H. W. PARKER, British Museum (Natural History).

Representatives of only nine species of these two groups were collected, and none are of especial taxonomic importance; all of them are moderately well-known forms, and all have previously been reported from Palestine. But they have some interest from a zoogeographical standpoint. Bodenheimer (1935) * has given a critical account of the whole fauna of Palestine from this aspect, and has traced the approximate limits of a number of faunal zones within the country. The Lake Huleh swamps are included by him in the "Upper Galilee" zone, which is characterized as essentially Mediterranean in character (p. 24) but with penetrating elements from the Euro-Siberian (p. 26). These are, of course, generalizations based on the general aspect of the fauna as a whole, and it is admitted that "the composition of the zoogeographical spectrum is not the same in any two groups of animals." Nevertheless it must be stressed that not a single one of the common reptiles and amphibians of the Lake Huleh swamps has a typical "Mediterranean" distribution, and many of them cannot be assigned to any of the major categories, Mediterranean, Saharo-Sindian, or Irano-Turanian, which Bodenheimer, following the phytogeographical work of Eig, uses. Scarcely any two of them have even approximately the same distribution, and, since their eastern limits are in many instances almost completely unknown, the difficulties of assigning them to the smaller zoogeographical units are obvious. The following notes on the approximate distribution, of the individual species may be of assistance to future workers in this field.

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* Bodenheimer, 1935, 'Animal Life in Palestine.'

AMPHIBIA, SALIENTIA.

Rana ridibunda ridibunda Pallas.

5 ♂♂, 4 ♀♀, juv. In the river and swamps.

Ranging from Central Germany through the Balkans eastwards to Transcaspia and Persia (precise limits unknown), and southwards to Palestine and the Hejaz (discontinuously in this region), this subspecies might be considered as Irano-Turanian; but the whole species, if *Rana esculenta* be included, is probably Euro-Siberian, with penetrations through the Mediterranean and Irano-Turanian zones.

Hyla arborea savignyi Audouin.

♂, 4 ♀♀. In the river and swamps.

This race, again, might be considered as Irano-Turanian with outliers in the Mediterranean zone. It occurs on Elba, Corsica, and Sardinia, but is absent from the mainland of Africa and Europe, and in Asia extends from Asia Minor to Central Asia and southwards in Arabia to the Hejaz. But the species *Hyla arborea*, considered as a whole, has a distribution similar to that of the preceding species.

Bufo viridis Laurenti.

♂, ♀. Yessud, Hamalla.

Distributed from eastern France to Mongolia, southwards to the Himalyas, Arabia, and the northern Sahara as far west as Morocco, this species is found throughout almost the whole of the Euro-Siberian, Irano-Turanian, Saharo-Sindian, and Mediterranean regions.

REPTILIA, SAURIA.

Mabuya vittata (Olivier).

2 juvs. Among dry trash at edge of swamp, Buseweye.

Known from Algeria eastwards to Iraq and north to Asia Minor, this species may be regarded as a Saharo-Sindian element extending into the levantine portion of the Mediterranean zone.

Chamæleo chamæleon chamæleon (Linn.).

2 ♀♀. At the swamp edge.

The common chamæleon, ranging along the whole of the southern and levantine shores of the Mediterranean and into southern Spain, has a distribution approximating more closely to that of the Mediterranean phytogeographical region than any other reptile in the present series; but its absence from almost the whole of southern Europe and its incursion into the Saharo-Sindian of northern Africa and Arabia (Sinai to the Hejaz) makes its distribution very atypical.

Natrix tessellata (Laurenti).

2 ♂♂, ♀, 9 juvs. In the swamp and lake at Buseweye.

Bodenheimer classes this among the Irano-Turanian elements (p. 28 *a*). It has been recorded over almost the whole of this region as far east as China, but also occurs in central and eastern Europe and throughout the Balkan and Italian peninsulas.

Coluber jugularis jugularis Linn.

Juv. Yessud Hamalla shore.

The typical subspecies, found from southern Asia Minor southwards through Syria to Palestine as far south as Kerak, appears to be confined to the levantine Mediterranean; but the species as a whole ranges from Hungary to Persia, and thus has a more extensive Mediterranean distribution and enters the Irano-Turanian.

Contia decemlineata Dum. & Bibr.

♂, ♀. Buseweye.

A species endemic in the levantine Mediterranean, ranging from southern Asia Minor to Palestine.

TESTUDINES.

Clemmys rivulata Val.

Juv. Lake Huleh.

The status of *rivulata* with regard to *caspica* is still uncertain. The latest commentator, Bird *, has given reasons for considering the two as distinct species, but unfortunately has not fully considered the limits of distribution of the two. Hitherto the river terrapins of Syria and Palestine have been considered to be *rivulata*, but Bird refers specimens from Dalmatia, Bosnia, and the Cyclades to *rivulata* and specimens from Cyprus and Damascus to the "typical form"; by "typical form" he presumably means *caspica*, since he is using the phrase antithetically to *rivulata*. Re-examination of the material does not support the contention that *caspica* reaches Damascus or Cyprus, and it seems probable that *rivulata* has a Balkano-Levantine distribution in the Mediterranean zone, and that *caspica*, ranging from central Asia Minor to Persia and perhaps beyond, is more of an Irano-Turanian element.

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* Bird, 1936, Ann. & Mag. Nat. Hist. (10) xviii. p. 259.

EXPLANATION OF THE PLATES.

PLATE XVI.

Fig. 1. Lake Huleh from the North west shore.
Fig. 2. The edge of the swamp, Melaha. The *fellah* is preparing the papyrus-bundle rafts from which much of the work was done.

Other plates of Lake Huleh were published in 'Nature,' vol. cxxxvi. p. 852, 1936.

PLATE XVII.

Fig. A. *Fredericella sultana* subsp. *jordanica* on weed. × 2.
Fig. B. *Fredericella sultana* subsp. *jordanica* from stone. × 2.
Fig. C. *Plumatella emarginata*, type 1. × 2.
Fig. D. *Plumatella emarginata*, type 2. × 2.

[To be continued.]

BIBLIOGRAPHICAL NOTICE.

A Guide to Veterinary Parasitology and Entomology for Veterinary Students and Practitioners. By T. SOUTHWELL, D.Sc., Ph.D., and A. KIRSHNER, M.B., Ch.B., D.T.M. Second Edition. London: H. K. Lewis & Co., 1938. Pp. xvi+176, 123 text-figs., 1 plate and 12 diagrams. Demy 8vo. Price 10*s*.

THE first edition of this handbook was noticed in this Journal in January 1938. The original text of that edition has been reprinted, with most of its rather numerous typographical and other errors unfortunately uncorrected, and with the addition of two chapters on Arthropoda. These are quite well illustrated, but there are some curious omissions. Mosquitoes, for instance, are dismissed in three lines as being of no veterinary importance, while fleas are not dealt with at all. A "host-parasite list" of Arthropod parasites is given at the end, but it is not explained why the pig and cat are excluded from it. The principle of reduction to essentials could hardly be carried further, and students may find that it has been carried so far as to render the book a somewhat unsafe guide.

H. A. B.

THE
ANNALS AND MAGAZINE
OF
NATURAL HISTORY.

[ELEVENTH SERIES.]

No. 12. DECEMBER 1938.

LXII.—*Notes on the Plecoptera of New Zealand, with Descriptions of new Species.* By D. E. KIMMINS, Department of Entomology, British Museum (Natural History).

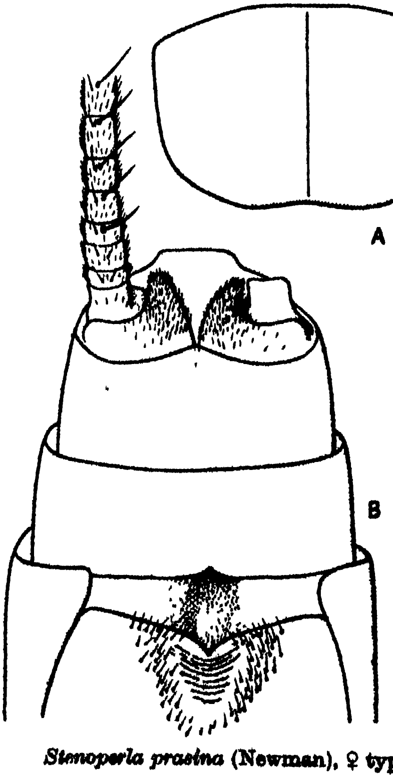
DURING the past five or six years the British Museum has received from Mr. G. V. Hudson much New Zealand material in the orders Neuroptera, Trichoptera, Ephemeroptera and Plecoptera, and his generosity has enabled us to fill many gaps in the Museum collections. Amongst the Plecoptera sent were several species new to science, but the publication of their descriptions was delayed for fear of clashing with any paper on this group that Dr. Tillyard might have had in preparation. In addition to describing these new species, I am taking this opportunity of supplementing Tillyard's 1923 paper on N.Z. Plecoptera by figuring and describing more fully some of the species dealt with therein, including the two New Zealand Plecoptera described by Newman, of which the types are in the British Museum.

Stenoperla prasina (Newman). (Figs 1–2.)

Chloroperla prasina Newman, 1845, Zoologist, iii. p. 852.
Hermes prasinus Walker, 1853, List Neur. Ins. Brit. Mus. ii. p. 206.
Stenoperla prasina McLachlan, 1866, Trans. Ent. Soc. Lond. ser. 3, v. p. 354; Hudson, 1892, Manual Entom. N.Z. p. 106, pl. xvi. fig. 3; Hutton, 1899, Trans. N.Z. Inst. xxxi. p. 212; Hudson, 1904, N.Z. Neuroptera, p. 5, pl. i. figs. 4–5; Tillyard, 1921, P. Linn. Soc. N.S.W. xlvi. p. 233, pl. xv. fig. 9, text-figs. 1, 4; Tillyard, Trans. N.Z. Inst. liv. p. 200, fig. 1; Helson, 1934, Trans. R. Soc. N. Zeal. lxiv. pp. 241–248, pls. xxxii.- xliv.

Newman's type in the British Museum is a female and I give below a description of the gentalia.

Fig. 1.

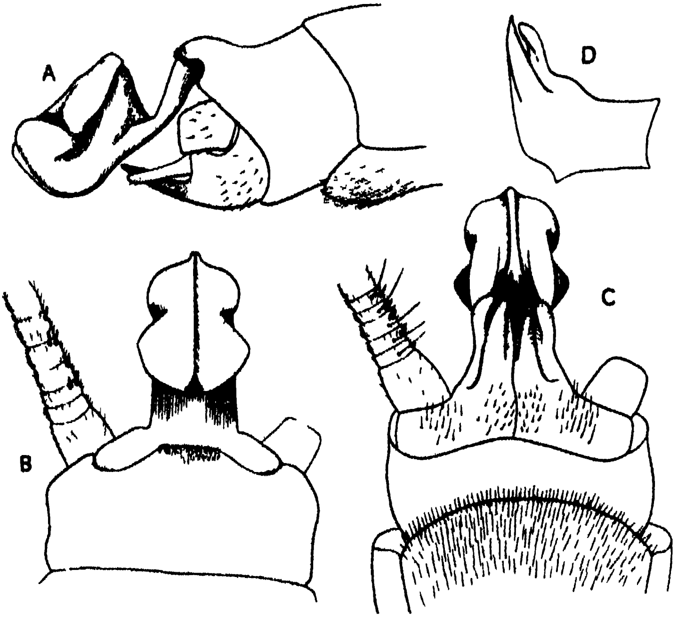


Stenoperla prasina (Newman), ♀ type.
A, outline of prothorax;
B, apex of abdomen from beneath.

♀.—Sub-genital plate about two-thirds as long as corresponding tergite, its apical margin slightly concave with a shallow V-shaped excision at its centre. Beyond it is a more chitinized area, terminating in a depression or pit. Sub-anal lobes with short, blunt, divergent apices. Cerci with the basal segments short, becoming progressively longer towards the apex. From seg. 4 onwards there is a strong bristle on the ventral surface of each towards the apex.

♂.—Tenth tergite with a patch of short bristles at the centre of its apical margin, which is a little raised. Supra-anal lobe large, its base broad, plate-like, directed downwards, its apex dilated and quadrilateral in side view. From above, there is a median longitudinal carina, lateral margins each with two dilatations, one rounded, the other triangular. Ventrally there is a broader carina in the apical half. Apical margin with a small blunt projection

Fig. 2.



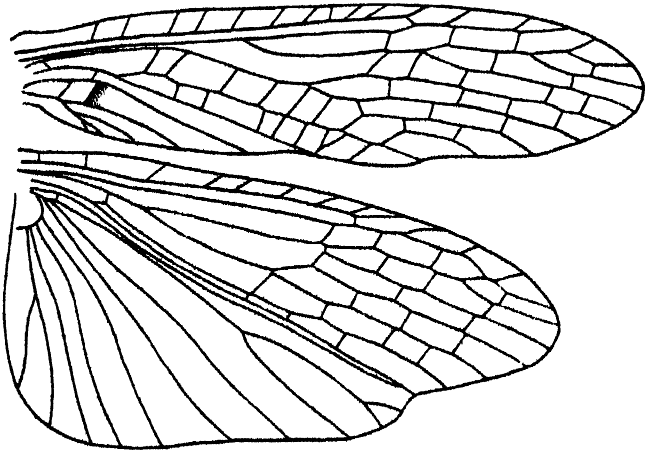
Stenoperla prasina (Newman), ♂.

A, apex of abdomen from side (only base of cercus shown); B, ditto, from above; C, ditto, from beneath; D, left sub-anal lobe, dissected out.

at its centre. Sub-anal lobe broad, inner angle produced and bifurcate; upper branch finger-like, somewhat membranous, lower about as long as upper, more chitinized, acute at its apex and upcurved. Cerci about 5 mm. long, segs. 2–5 broader than long, all segs. except the first with one (or two) bristles on the under surface towards the apex: segs. 3–7 with two or three short, strong spines on inner side. Sub-genital plate broad, apex produced and rounded.

Tillyard records that this species is "found in all parts of New Zealand where there is running water." I have seen examples from both islands, and I find some difficulty in reconciling the ♂ genitalia of our examples with that figured by Helson (1934) from South Island examples. It is possible that his work was based on another species.

Fig. 3.



Austroperla cyrene (Newman), ♂ type. Wings.

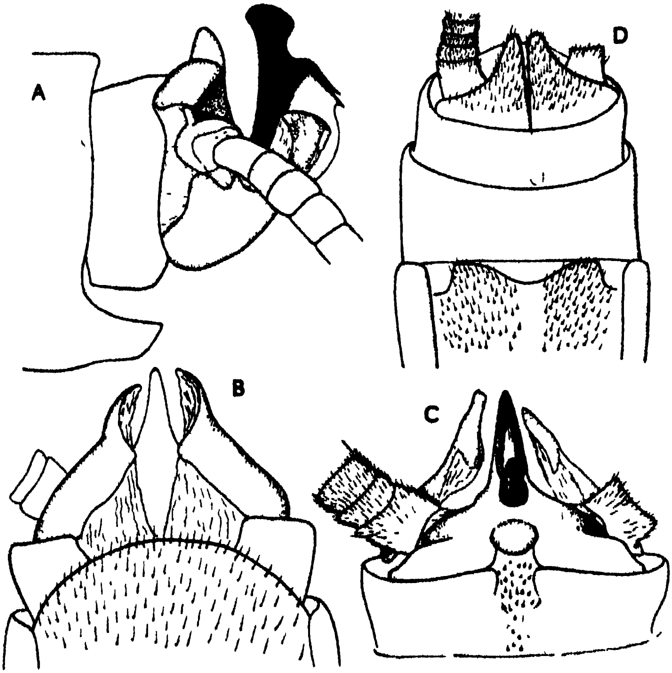
Austroperla cyrene (Newman). (Figs. 3–4.)

Chloroperla cyrene Newman, 1845, Zoologist, iii. p. 853.
Perla (?) *cyrene* Walker, 1852, Cat. Neur. Brit. Mus. i. p. 168.
Genus undet. McLachlan, 1874, Trans. N.Z. Inst. vi. App. xcii.
Stenoperla (?) *cyrene* Hutton, 1899, Trans. N.Z. Inst. xxxi. p. 212.
Austroperla cyrene Needham, 1905, Proc. Ent. Soc. Wash. xviii. p. 109.
Heteroperla cyrene Hare, 1910, Trans. N.Z. Inst. xlii. p. 30.
Austroperla cyrene Tillyard, 1923, Trans. N.Z. Inst. liv. p. 201.

Type ♂.—The entire body is black, legs piceous with a broad yellow band towards the base of each tibia.

Pronotum quadrate, sides straight, very slightly broader at the base than apex, angles scarcely produced. Median longitudinal furrow only slightly indicated. Wings blackish brown, darker in the subcostal areas, and with a pale yellowish patch at the base of the anterior wing. There is also a pale streak along part of the costa of each wing. Posterior margin of anterior wing somewhat produced between the branches of the cubitus. Tenth tergite with a median, membranous dorsal area, giving it the appearance of being divided. Supra-anal lobe in dorsal view triangular, with a wide shelf-like base, in the centre of which is a large, conical tubercle. From beneath this shelf the lobe is directed downwards and then bent upwards to a strongly-pigmented clavate apex.

Fig. 4.



Austroperla cyrene (Newman).

A, ♂ type, apex of abdomen from side; B, ditto, from beneath; C, ditto, from above; D, ♀, ditto, from beneath.

On the ventral surface of the lobe, before the apex, there is a keel-like dilatation with two spines at its apex. Sub-anal lobes broad at their bases, directed upwards on each side of the supra-anal lobe. The apical half is constricted and has a pigmented central portion and membranous margins. Cerci short, joints towards the base broad, flattened, less chitinized beneath; apical joints cylindrical, longer than broad. Subgenital plate produced and rounded, its base about as wide as the segment.

♀.—Sub-anal lobes from beneath subtriangular, their outer sides concave. Sub-genital plate short, wide, quadrangular, with the centre of its apical margin concave. The plate arises a short distance before the apex of the sternite.

The ♂ type bears the label in manuscript " *Chloroperla cyrene* " " New Zealand," and a printed label " Saunders, 68–3." For the purposes of the above description, the apex of the abdomen has been removed, cleared in caustic potash and mounted in Canada Balsam, and one pair of wings has been spread out between sheets of celluloid to elucidate the venation. The description of the female genitalia is based on an example from Ohakune, collected by T. R. Harris.

I have seen other examples from Wainui-o-mata, Karori, Wellington, Wilton's Bush, and Gollans Valley, collected by Mr. G. V. Hudson, and from Lindes Pass (*Pascoe*).

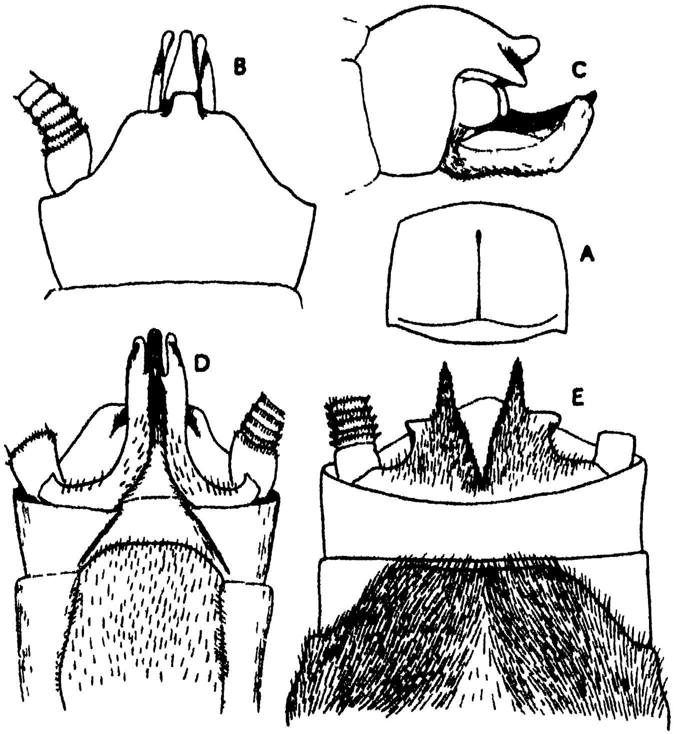
Megaleptoperla grandis (Hudson). (Fig. 5.)

Leptoperla grandis Hudson, 1913, Trans. N. Zeal. Inst. xlv. p. 51.
Megaleptoperla grandis (Hudson), Tillyard, 1923, *op. cit.* liv. pp. 204–5, figs. 3–4.

Tillyard's figure of the venation of this species does not show any lobe-like projection on the posterior margin of the anterior wing between the branches of the cubitus. In examples from Ohakune (the type-locality), which agrees in other respects with Tillyard's diagnosis, this lobe is present, and I suspect that its absence from his figure is accidental. Mr. Hudson informs me that this lobe is present in his type.

♂.—Genitalia: apical margin of the tenth tergite produced at its centre in a truncated triangle, the centre of the truncated portion again produced in a quadrangular raised knob. Supra-anal lobe in the form of a narrow triangular hook, in side-view directed downwards and then backwards, and bearing on its ventral surface towards the apex a basally directed tooth. Upper margins of the supra-anal lobe finely serrate. Cerci about 3 mm. long, tapering, clothed with fine hairs, the segments

Fig. 5.



Megaleptoperla grandis (Hudson).

A, outline of prothorax; B, ♂, apex of abdomen from above; C, ditto, from side; D, ditto, from beneath; E, ♀, ditto, from beneath.

near the base being much shorter than broad. From beneath each cercus there arises the sub-anal plate, which curves backwards and upwards beside the supra-anal lobe. Margin of the ninth sternite somewhat produced in a broad, truncate sub-genital plate

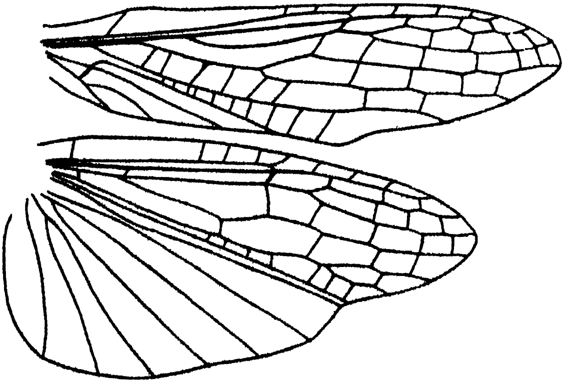
♀.—Sub-genital plate similar in shape to that of ♂, but wider, its base as wide, and its truncate apex about half as wide, as the segment. Sub-anal plates terminating in slender acute apices, each outer margin with a strong angular projection about midway.

Of this species I have only seen examples from Ohakune, collected by T. R. Harris.

Megaleptoperla diminuta, sp. n. (Figs. 6–7.)

In coloration resembling *M. grandis* (Hudson), but the membrane of the wings, particularly of the posterior, darker. Pronotum with the anterior angles acute and with a transverse furrow behind the head. Posterior transverse furrow much as in *grandis*. Meso- and metanotum without a pale median longitudinal band. Fore tibia dark fuscous, with two pale testaceous bands. Fore tarsus dark fuscous, basal segment testaceous. Anterior wings without a complete series of costal cross-veins; branches of *Rs* and M_{1+2} in both wings not noticeably zigzagged. Abdomen dark fuscous.

Fig. 6.



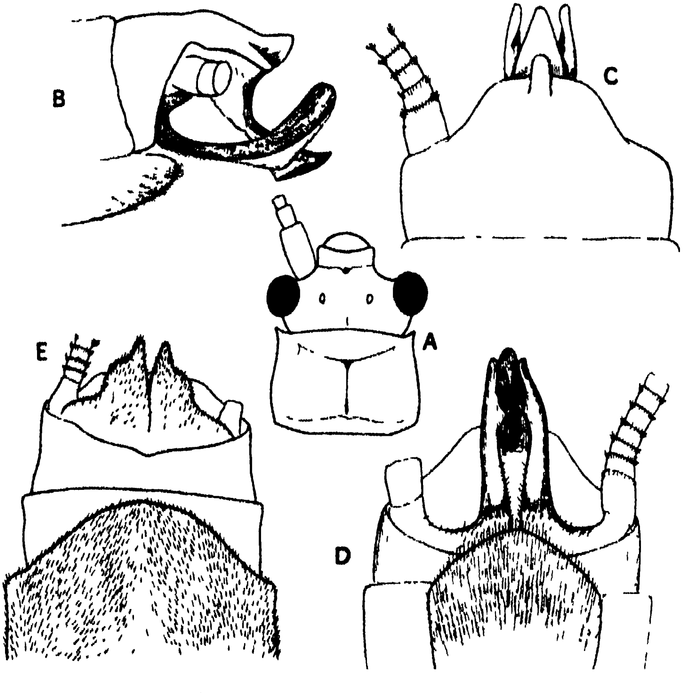
Megaleptoperla diminuta, sp. n., ♂. Wings.

♂.—Genitalia differing from that of *grandis* in the following points:—the produced knob of the tenth tergite is longer and narrower, in lateral aspect triangular. Supra-anal lobe rather stouter from above. Cerci a little over two millimetres in length, the segments near the base longer in relation to their width. Sub-genital plate larger, somewhat inflated, its apical margin more produced and triangular.

♀.—Sub-genital plate as wide as the segment, produced in a large, rounded triangle. Sub-anal plates with short stout apices, each outer margin with a rounded shoulder about midway.

Length of anterior wing, ♂ 13 mm., ♀ 16 mm.

Fig. 7.



Megaleptoperla diminuta, sp. n.

A, head and prothorax ; B, ♂, apex of abdomen from side ; C, ditto, from above ; D, ditto, from beneath ; E, ♀, ditto, from beneath.

New Zealand, Ohakune, 1922–23 (*T. R. Harris*); Waimarino National Park, i. 1931 (*G. V. Hudson*).

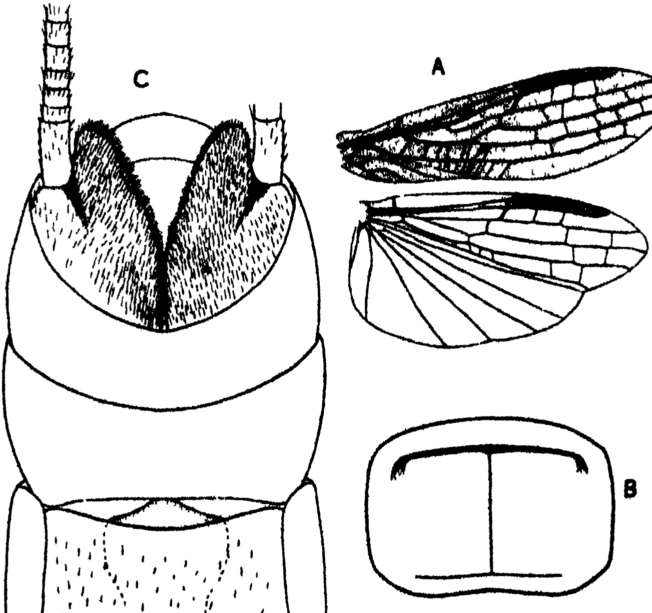
Type ♂ (from Ohakune) in British Museum (Nat. Hist.), paratypes in the British Museum and G. V. Hudson Collections.

This species is distinguished from *M. grandis* (Hudson) by its smaller size, acute anterior angles of the pronotum, absence of a complete series of costal cross-veins in anterior wing, regular branches of *Rs* and M_{1+2} in both wings, and the form of the genitalia in both sexes. The body appears to be more heavily chitinized.

Nesoperla flavescens, sp. n. (Fig. 8.)

♀ (dried).—Head dark fulvous, blackish between the ocelli. Eyes dark brown. Antennæ about 8 mm. long, fulvous. Pronotum 1 mm. long by 1·35 mm. wide, fulvous, anterior and posterior angles rounded; a strong transverse anterior groove, bent tailwards at its apices, posterior groove less pronounced. Meso- and metanota and legs fulvous. Anterior wing pale yellowish brown, veins golden brown. Posterior wing paler, only the

Fig. 8.



Nesoperla flavescens, sp. n., ♀.
A, wings; B, prothorax;
C, apex of abdomen from above.

stigma noticeably yellowish. Venation as in fig. 8 A. Abdomen testaceous, apex fulvous. Sub-genital plate not produced, apical margin slightly concave, covering a somewhat pyriform pocket. Margin of the tenth tergite slightly produced and rounded. Cerci 3 mm. long, filiform, fulvous. Sub-anal lobes large, apices rounded.

Length of anterior wing 10 mm., posterior wing 9 mm.

New Zealand, S. Island, L. Wakatipu, ii. 1911 (*G. V. Hudson*).

Type ♀ in British Museum.

I had originally determined this specimen as *Nesoperla howesi* Tillyd., but after making a preparation of the abdomen I was compelled to change my opinion. Tillyard describes and figures the ventral plate of *howesi* as "projecting in the form of a semi-oval lobe, rather narrow"; even in a state of dessication, I cannot imagine the subgenital plate of *flavescens* assuming this form. Further differences occur in the form of the pronotum, the paler colour and smaller size.

Notonemoura latipennis Tillyard. (Fig. 9.)

Notonemoura latipennis Tillyard, 1923, Trans. N.Z. Inst. liv. p. 215.

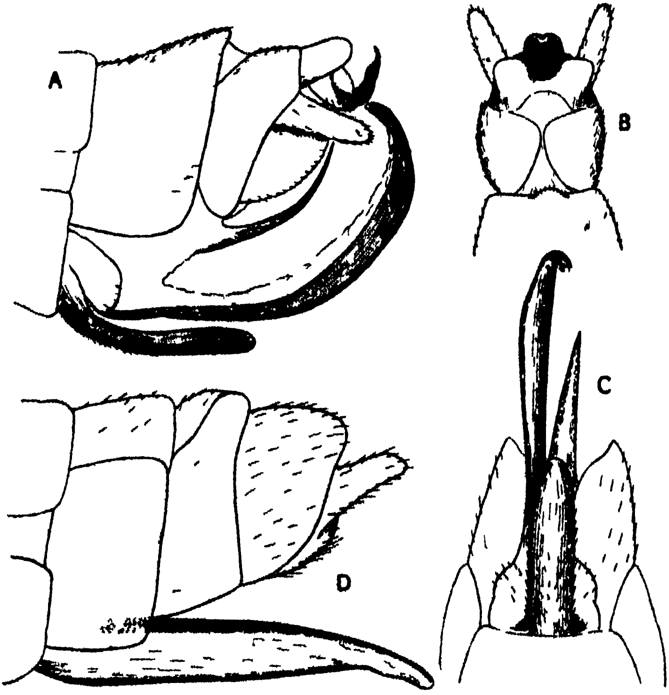
As Tillyard's account of the ♂ genitalia is very brief and the ♀ was unknown, I am taking this opportunity of describing and figuring both

♂.—Genitalia: ninth tergite slightly produced; ninth sternite with long, stout, ventral process, apical margin of sternite produced in a long, slender, upturned hook, formed of two subparallel ribs, joined by membrane. Margin of the tenth tergite produced to make two blunt knobs with a rounded excision between them. Supra-anal plate with a slender, upwardly-directed hook at its apical margin. Cerci slender, about twice as long as the tenth tergite. From below the pleurites of the tenth segment arises a pair of slender, lightly-chitinized spines, joined by membrane; in lateral view curving upward (? tenth sternite).

♀.—Ventral surface of abdomen towards apex carrying a long ovipositor like organ, composed of the produced portions of the eighth and the basal margins of the ninth sternites and the intersegmental membrane. Pleurites of segments eight and nine more chitinized than their tergites. Cerci stout, nearly as long as tenth segment.

Dr Tillyard had examples from Karori, Wellington, and Arthur's Pass I have also seen examples from Wiltons Bush

Fig 9



Notonemoura latipennis Tillyard.

A, ♂, apex of abdomen from side, B, ditto, from above, C, ditto from beneath, D, ♀, ditto, from beneath

Spaniocerca Tillyard.

Spaniocerca Tillyard, 1923, Trans N.Z Inst liv p 216

Genotype . *S. zelandica* Tillyard.

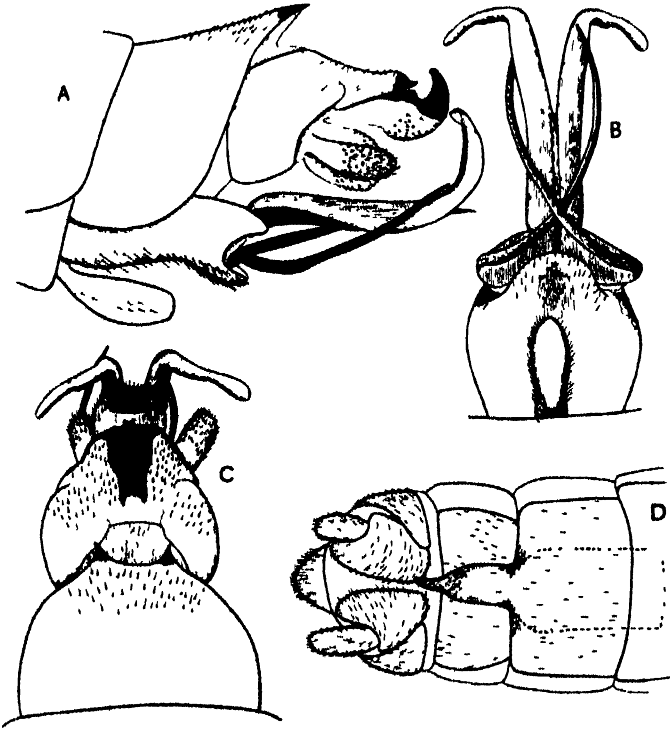
Sc arching up so as to meet or nearly meet the costal margin. Cross-vein *m–cu* in fore wing ending above on M_{3+4} at an angle to it, this latter vein much curved as it leaves the transverse cord. Pterostigma with only one veinlet (Sc_2) in both wings Anal fan rather narrow.

♂.—Genitalia: ninth tergite with the apical margin produced in the centre to form a pair of spines. Ninth sternite more or less produced apically as a sub-genital plate, and with a median ventral process at its base.

Titillators each two-branched, the upper pair stouter, rather sheath-like, the lower slender, spiniform, crossing each other at their bases. Pleurites of the tenth segment with a pair of cerci. Tenth tergite indefinitely separated from its pleurites, carrying at its apex a supra-anal lobe in the form of a strongly-chitinized, upturned hook.

Female with a long, narrow, sub-genital plate projecting beneath the margin of the eighth sternite.

Fig. 10.



Spaniocerca zelandica Tillyard.

A, ♂, apex of abdomen from side ; B, ditto, from beneath ; C, ditto, from above ; D, ♀, ditto, from beneath.

Spaniocerca zelandica Tillyard. (Fig. 10.)

Spaniocerca zelandica Tillyard, 1923, Trans. N.Z. Inst. liv. p. 216.

♂.—Head yellowish brown, blackish between the ocelli; antennæ fuscous. Pronotum fuscous, subrectangular; meso- and metanota shiny pitchy black,

the former with a paler brown patch posteriorly. Legs as in female. Abdomen black.

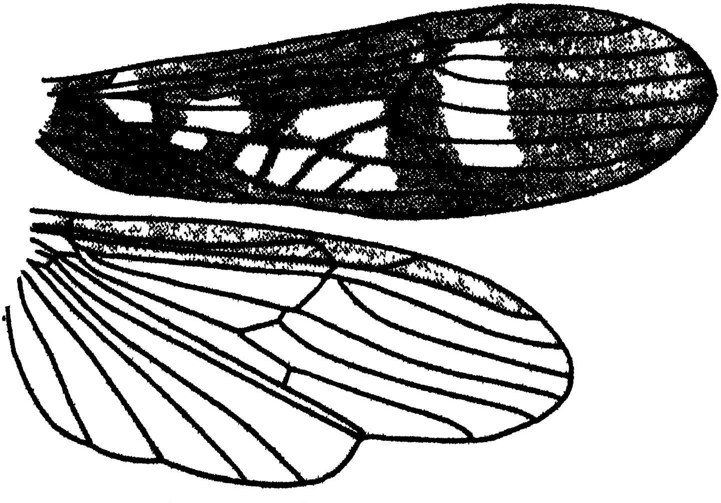
Genitalia: ninth tergite with two divergent spines on the produced apical margin, with a shallow excision between them. Ninth sternite with its apical margin produced in a rounded lobe in ventral aspect, in lateral aspect with a rounded excision. Ventral process about two-thirds as long as ninth sternite. Upper branches of titillators long, fused at their bases, sheath-like, each membranous towards its apex, with a chitinized stiffening along its upper margin. Its apical third is bent upwards and outwards. Lower branches slender, spiniform, directed inwards and backwards, crossing each other near their bases. Cerci short. Tenth tergite strongly pigmented towards its apex, which carries four small teeth. From it arises the supra-anal lobe, a broad, blackened, upturned hook.

Length of fore wing 9·0 mm., hind wing 7·5 mm.

♀.—Subgenital plate narrow, abruptly constricted in its apical third and again constricted near its apex, which is slender and pointed and extends beyond the apical margin of the ninth sternite.

I have seen a number of specimens from Nelson, Wiltons Bush and South Karori.

Fig. 11.

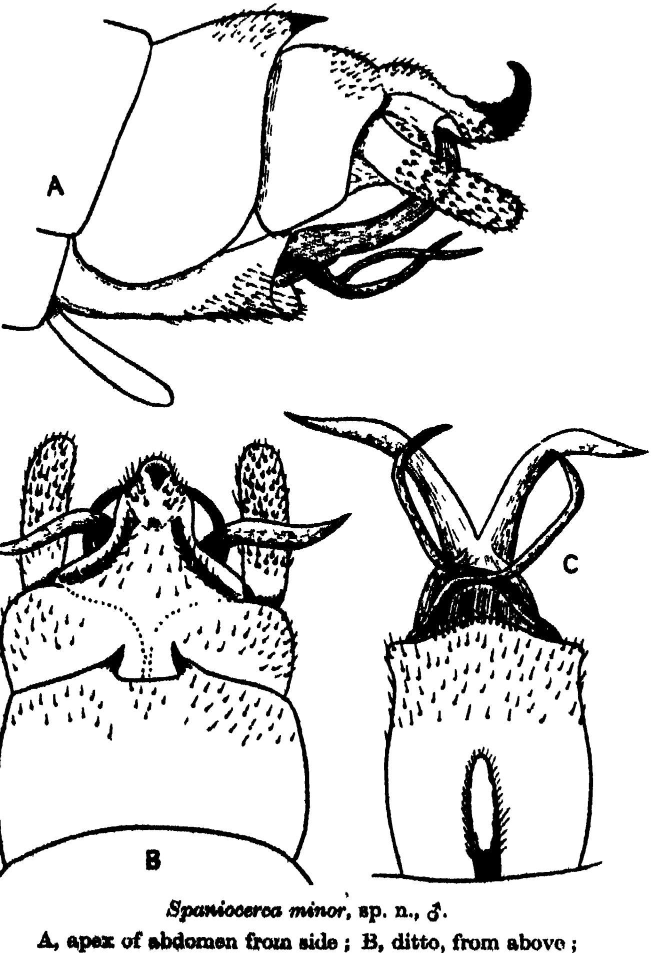


Spaniocercoides minor, sp. n., ♂. Wings.

Spaniocerca minor, sp. n. (Figs. 11–12).

♂.—Head shining piceous, antennæ slightly paler. Pronotum piceous, subrectangular, narrower than head with eyes; meso- and metanota shining piceous. Legs fuscous, posterior femora with a pale ring at about one-third from its apex, posterior tibiæ with a fuscous band

Fig. 12.



Spaniocerca minor, sp. n., ♂.
A, apex of abdomen from side; B, ditto, from above; C, ditto, from beneath.

at base, remainder dull yellowish. Abdomen blackish, tenth segment and ventral process reddish brown.

Genitalia: ninth tergite with a pair of convergent spines on the apical margin, enclosing a somewhat rectangular excision. Ninth sternite from beneath with its apical margin only slightly produced. Ventral process narrower than in *S. zelandica*. Upper branches of titillators fused at their bases, curved upwards and outwards, terminating in acute apices. Lower branches spiniform, directed inwards and crossing each other, their apices acute and curved towards each other. Cerci longer than in *S. zelandica*, extending slightly beyond the supra-anal lobe. Tenth tergite indefinitely separated from its pleurites, without the strong chitinization of *zelandica*. Supra-anal lobe terminating in a narrow upturned hook.

Fore wings fuscous with brownish venation, hyaline areas as in fig. 11. Apex less acute than in *zelandica*. Hind wings pale fuscous, costal and sub-costal areas darker.

♀ unknown.

Length of fore wing 6 mm., hind wing 5 mm.

New Zealand, Arthur's Pass, 3–4000 ft., Jan. 1933, Jan. 1935 (*G. V. Hudson*). Type ♂ and 2 paratypes in British Museum.

SPANIOCERCOIDES, gen. nov.

In general appearance the genotype resembles *Spaniocerca minor*, but differs in venation, wing-pattern and particularly in genital structure.

Anterior wing: transverse cord interrupted, not straight as in *Spaniocerca*. Area between Cu_1 and Cu_2 wider.

Posterior wing: Cu_2 and $1A$ meet the posterior margin at some distance from one another (close together in *Spaniocerca*).

♂.—Genitalia: ninth tergite without spines on the apical margin, which is not produced at its centre. Ninth sternite considerably produced in a long upturned process, as in *Notonemoura*, median ventral process present. Titillators not branched, dilated towards their apices. Pleurites of tenth segment bearing modified, one-segmented cerci, terminating in a strong spur. Tenth tergite with a supra-anal lobe, which is longer and more slender than in *Spaniocerca*.

♀.—Sub-genital plate in the form of two triangular plates with rounded apices.

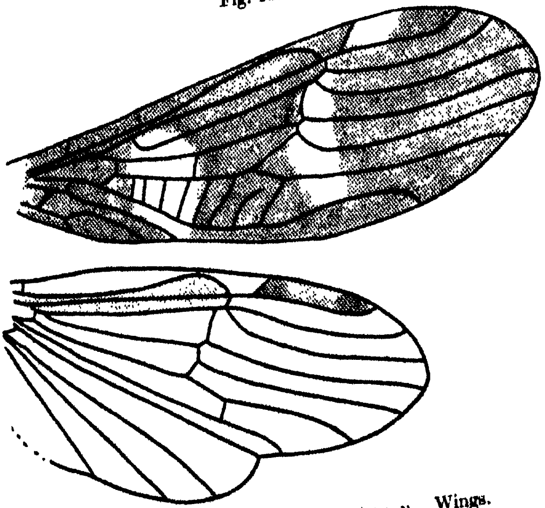
Genotype : *S. hudsoni*, sp. n.

Spaniocercoides hudsoni, sp. n. (Figs. 13–15.)

Spaniocerca minor.

♂.—General appearance as in *Spaniocerca minor*. A pale area in the anterior wing over the transverse cord, a smaller area at the base of the pterostigma and another, less distinct, towards the base of the wing.

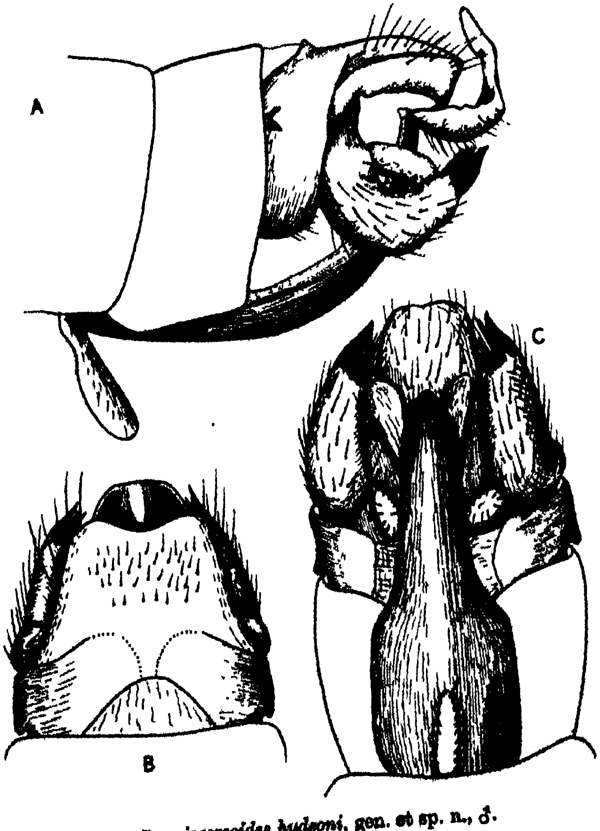
Fig. 13.



Spaniocercoides hudsoni, gen. et sp. n. Wings.

Genitalia : ninth tergite with its apical margin straight or slightly concave. Ninth sternite narrow, its apical margin produced in a long, upcurved process, the upper surface of which is membranous, the lower surface chitinous and convex. Ventral process narrow. Titillators long, arching upwards and tailwards, largely concealed from beneath, their apices appearing on each side of the tip of the ninth sternite. Cerci strongly chitinized, curved, and each bearing at its apex a stout spur and a dense tuft of fine setæ. Tenth tergite indistinctly separated from its pleurites, moderately chitinized, apical margin slightly excised. Supra-anal lobe in the form of a slender hook arising at right-angles from a broad base.

Fig. 14.



Spaniocercoides hudsoni, gen. et sp. n., ♂.
A, apex of abdomen from side; B, ditto, from above; C, ditto, from beneath.

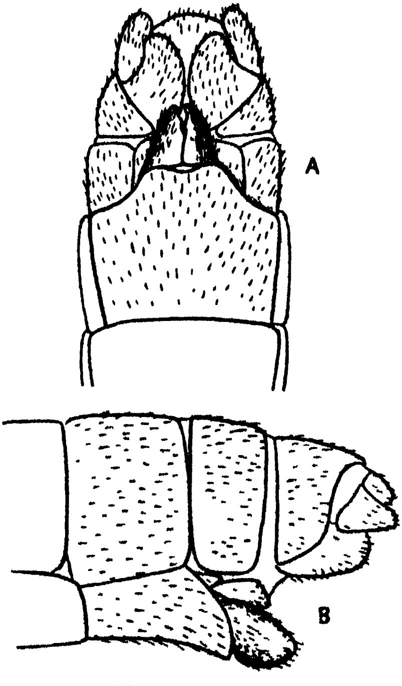
♀.—Sub-genital plate arises from the margin of the eighth sternite, and consists of a pair of somewhat convex, triangular plates with rounded apices. They extend beyond the apex of the ninth sternite.

Length of anterior wing: ♂ 7, ♀ 6 mm.
" posterior wing: ♂ 6, ♀ 5 mm.

New Zealand, Korokoro, 12. x. 23, 1 ♂; Upper Hutt, 1. xii. 25, 1 ♀; Arthur's Pass, 3000–4000 ft., i. 33, 1 ♀ (*G. V. Hudson*).

♂ type, ♀♀ paratypes in the British Museum.

Fig. 15.



Spaniocercoides hudsoni, gen. et sp. n., ♀.
A, apex of abdomen from beneath; B, ditto, from side.

List of New Zealand Plecoptera.

EUSTHENIIDÆ.

1. *Stenoperla prasina* (Newman).

AUSTROPERLIDÆ.

2. *Austroperla cyrene* (Newman).

LEPTOPERLIDÆ.

3. *Megaleptoperla grandis* (Hudson).
4. —— *diminuta*, sp. n.

5. *Zelandobius confusus* (Hare).
6. —— *hudsoni* (Hare).
7. —— *furcillatus* Tillyard.
8. —— *unicolor* Tillyard.
9. *Nesoperla fulvescens* Tillyard.
10. —— *howesi* Tillyard.
11. —— *flavescens*, sp. n.
12. —— *spiniger* Tillyard.
13. —— *trivacuata* Tillyard.
14. *Zelandoperla decorata* Tillyard.
15. —— *maculata* (Hare).
16. —— *fenestrata* Tillyard.

NEMOURIDÆ.

17. *Notonemoura latipennis* Tillyard.
18. *Spaniocerca zelandica* Tillyard.
19. —— *minor*, sp. n.
20. *Spaniocercoides hudsoni*, gen. et sp. n.

LXIII.—*A List of the Type-hosts of the Mallophaga and the Lice described from them.* By GORDON B. THOMPSON.

THE type-host of a species of Mallophaga is the species of bird or mammal from which the type-specimen of the louse is obtained.

Introduction.

Although the more prolific describers of Mallophaga have all given classified lists of the hosts from which the lice were obtained, there is no modern list of this kind, and the host-names used are often so far sunk into disuse that it is extremely difficult for the modern student, unless he be an ornithologist and also a student of the mammals, to know what host is meant; this has frequently led to unnecessary descriptions. Another great disadvantage of the existing lists is that they almost invariably include not only the type-host of a louse, but all the hosts from which the species has been stated to be obtained. This latter is an extremely important point, for in the case of a large number of the earlier described species of lice the host is practically our only guide to the species meant by the description.

We now know that the lice found on closely related species of birds often resemble each other superficially, but may differ markedly in details (such as the male genitalia) which were not dealt with by the earlier workers in the classification and descriptions of the Mallophaga.

For these reasons it has seemed desirable to compile a classified list of mammals and birds, under current names, and of the lice of which they are type-hosts. The absence of a record of a species of louse under the name of a given host does not in any way imply that records of the louse from that host are incorrect (though there is no doubt that many such records are unreliable), but merely that the animal in question is not an original host.

In the case of species described from specimens which have straggled on to an unusual host, and been described from such stragglers, certain difficulties arise. Such stragglers are included in this list only in the group of hosts from which they were derived, except in cases where this is unknown; in the latter instances they will be found, indicated as stragglers, under the host from which they were described. Species of lice which were originally described from more than one host, and of which a type-host has not yet been designated, are shown under all these hosts, followed by "(part)"; cross-references are given to enable the other hosts of such species to be ascertained. Any departure from this arrangement will be duly indicated.

The synonymy of the Mallophaga provides a problem of rather unusual difficulty. Apart from the normal difficulties of this question, Nitzsch listed a very large number of species, and made manuscript drawings and descriptions of them, but did not publish his descriptions except in a very few instances; these *nomina nuda* passed current throughout the scientific world until Burmeister (in 1838), Denny (in 1842), and Giebel (from 1861 to 1874) published descriptions of the vast majority of Nitzsch's species, the first- and last-named authors working with Nitzsch's specimens (of which, meanwhile, a considerable number had been lost) and from his manuscript descriptions and drawings. It is clear, however, that in a number of instances the species described by Denny under a given Nitzschian name is not the same as that described by Giebel under the same name. Giebel has evaded the difficulty by treating Nitzsch's names (whether published as *nomina nuda* or unpublished) as valid, and giving new names, when thought unnecessary, to the forms described by Denny; but this is not in accordance with the rules of nomenclature. It is not possible to decide the validity or otherwise of a Nitzschian name from Giebel's work or from any other of the older authors, and students may refer to Harrison's 'List of the Genera and Species of the Mallophaga' (1916), which gives most valuable information as to the earliest valid publication of the names.

Since it is clear that in many cases (perhaps the majority) names previously sunk as synonyms will have to be restored to validity, it has been thought necessary to include all synonyms, and to treat all validly published names as good species, the published synonymy being considered to be somewhat unreliable. To this rule the only exception which has been made (except that some names which seem to be hopelessly unidentifiable have been relegated to an Appendix) is in the case of genuine *nomina nuda*; in this case there cannot be any doubt as to the two names being synonymous. *Nomina nuda* have been ignored, as have *lapsi calami*, unjustified emendations of names, unjustified *nomina nova*, and a number of species which were so insufficiently described that they were regarded by Harrison as not capable of transfer to modern genera. A list of all discarded names will be given as an Appendix, together with the reasons which have led to their rejection.

Considerable difficulty arises as to genera in which species should be placed, since many of the older descriptions are not such as to allow of placing species with certainty in the new genera which have been described in recent years. Species have been retained in the genera in which they were placed by Harrison (1916) unless there is good evidence of the necessity of their transfer to more modern genera.

As the synonymy in bird names is extremely complicated it has been considered necessary to add, at the end of each record, the name of the host together with the locality etc. as originally published. This should enable ornithologists and mammalogists to check any errors into which I may have fallen.

Peters' 'Check-list of the Birds of the World' is followed with regard to the names of the birds. In the case of the mammals the particular works followed will be noted as the parts appear.

Note.—In a paper published in 1937 I designated type-hosts for all Denny's species. It has not been thought necessary to enter these species under any but the host so designated.

Class **AVES.**

Subclass NEORNITHES

Superorder PALÆOGNATHÆ

Order STRUTHIONIFORMES.

Family **Struthionidæ.**

1 **Struthio camelus** Linn. (Ostrich.)

Struthiolipeurus quadrimaculatus (Piaget), 1880. On *Struthio camelus*, Rotterdam Zoo

Struthiolipeurus struthionis (Gervais), 1847. On " Autruche "—from Tunis *.

Order RHEIFORMES.

Family **Rheidæ.**

2 **Rhea americana** (Linn.). (Rhea.)

Esthiopterum latum (Piaget), 1880. On *Rhea americana*, Rotterdam Zoo.

Struthiolipeurus rheæ (Harrison), 1916 (part ; see 3), *nom. nov.* for *Lipeurus asymmetricus* Piaget, 1885, *nec* Rudow, 1870. On *Rhea macrorhyncha*, Hyslop Coll.

3. **Pterocnemis pennata** (d'Orbigny). (Darwin's Rhea.)

Struthiolipeurus rheæ (Harrison), 1916 (part ; see 2). On *Rhea darwini*, Hyslop Coll.

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* This host is *Struthio c. camelus* Linn.

Order CASUARIIFORMES.

Family **Dromiceiidæ.**

4. **Dromiceius novæhollandiæ** (Latham). (Emu.)

Dahlemhornia asymmetrica (Nitzsch in Giebel), 1866. On *Dromæus novæhollandiæ*, Paris Zoo.

Dahlemhornia setosa (Le Souëf & Bullen), 1902. On *Dromæus novæhollandiæ* from Australia.

Order APTERYGIFORMES

Family **Apterygidæ.**

5. **Apteryx australis australis** Shaw. (Kiwi.)

Aptericola gadowi Harrison, 1915. On *Apteryx australis*, Cambridge University Museum.

6. **Apteryx australis lawryi** Rothschild. (Stewart Island Kiwi.)

Aptericola novæzealandiæ Harrison, 1915. On *Apteryx lawryi*, Cambridge University Museum.

7. **Apteryx haastii** Potts.

Aptericola gracilis Harrison, 1915. On *Apteryx haasti* Cambridge University Museum.

Order TINAMIFORMES.

Family **Tinamidæ.**

8. **Tinamus tao tao** Temminck.

Menopon brachygaster Giebel, 1874. On *Crypturus tao*. Straggler; true host unknown.

Oxylipeurus appendiculatus var major (Piaget), 1880 (p. 357), *nec* Piaget, 1880 (p. 346). Straggler *.

Pseudolipeurus taoi Carriker, 1936. On *Tinamus t. tao* from Bolivia.

Rhopaloceras aliceps (Nitzsch in Giebel), 1874. On *Crypturus macrurus* † from Brazil.

Rhopaloceras longiceps (Giebel), 1874. On *Crypturus tao.*

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* True host *Megapodius* sp. (Clay, 1938).

† The true host of this species is probably *Tinamus major* (Gmelin). (See Carriker, 1936.)

Rhopaloceras oniscus (Nitzsch in Giebel), 1866. On *Crypturus tao.*

Heptagoniodes excavatus (Piaget), 1880. On *Tinamus canus*, Leyden Mus.

Heptagoniodes mirabilis Carriker, 1936. On *Tinamus t. tao* from Venezuela.

Ornicholax alienus alienus (Giebel), 1874. On *Crypturus macrurus* * from Brazil.

Ornicholax alienus taoi Carriker, 1936. On *Tinamus t. tao* from Venezuela.

Kelloggia agona (Nitzsch in Giebel), 1874. On *Crypturus tao.*

9. **Tinamus tao kleei** (Tschudi).

Pterocotes aberrans taoi Carriker, 1936. On *Tinamus tao kleei* from Peru.

10. **Tinamus major fuscipennis** Salvadori.

Megaginus quadrithorax Carriker, 1936. On *Tinamus major robustus* from Costa Rica.

Heptarthrogaster parvulus (Taschenberg), 1882. On *Tinamus robustus* from Costa Rica.

11. **Tinamus major castaneiceps** Salvadori.

Pseudolipeurus tinami (Carriker), 1903. On *Tinamus robustus* from Costa Rica †.

Rhopaloceras genitalis simplex Carriker, 1936. On *Tinamus major castaneiceps* from Costa Rica.

Heptarthrogaster minutus (Carriker), 1903. On *Tinamus robustus* from Costa Rica ‡.

Pterocotes aberrans aberrans (Carriker), 1903. Same date.

Ornicholax alienus robustus Carriker, 1903. Same data.

Kelloggia brevipes Carriker, 1903. Same data.

12. **Tinamus major latifrons** Salvadori.

Megapeostus alterus Clay, 1937. From *Tinamus major latifrons.*

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* See previous footnote, †, on p. 584.

† Carriker (1936) notes that the host was wrongly determined originally.

‡ See previous footnote †.

13. **Tinamus major major** (Gmelin).

Nirmocotes cordiceps Carriker, 1936. On *Tinamus m. major* from British Guiana.
(See also no. 8.)

14. **Tinamus solitarius** (Vieillot).

Strongylocotes wernecki Guimarães & Lane, 1937. On *Tinamus solitarius*, Brazil..
Heptarthrogaster oliverioi Guimarães & Lane, 1937. Same data.
Pterocotes aberrans solitarius Guimarães & Lane, 1937. Same data.
Heptagoniodes clayi Guimarães & Lane, 1937. Same data.
Ornicholax solitarius Guimarães & Lane, 1937. Same data.

15. **Tinamus serratus ruficeps** Sclater & Salvin.

Rhopaloceras genitalis genitalis Carriker, 1936. On *Tinamus serratus ruficeps* from Colombia.
Megapeostus asymmetricus ruficipitis Clay, 1937. On *Tinamus serratus ruficeps* from Peru.

16. **Tinamus serratus serratus** (Spix).

Strongylocotes angulocapitis Carriker, 1936. On *Tinamus s. serratus* from Bolivia.
Heptarthrogaster grandis Carriker, 1936. Same data.

17. **Nothocercus nigrocapillus nigrocapillus** (G. R. Gray).

Pseudolipeurus grandis Carriker, 1936. On *Nothocercus n. nigrocapillus* from Bolivia.
Strongylocotes subspinosus Carriker, 1936. Same data.
Physconella nothocercæ Carriker, 1936. Same data.
Trichodopeostus spinosus Carriker, 1936. Same data.
Austrokelloggia intermedia Carriker, 1936. Same data.

18. **Nothocercus nigrocapillus cadwaladeri** Carriker.

Nothocotus subsimilis Carriker, 1936. On *Nothocerus nigrocapillus cadwaladeri* from Peru.
Rhopaloceras laticeps abbreviatus Carriker, 1936. Same data.

Trichodopeostus incertus Carriker, 1936. Same data.
Heptapsus tergalis tergalis Carriker, 1936. On *Nothocercus n. nigrocapillus* from Peru *.

19. **Nothocercus julius** (Bonaparte).

Strongyloctes spinosus (Piaget), 1880. On *Tinamus julius*, Leyden Mus.
Rhopaloceras laticeps laticeps (Piaget), 1880. On *Tinamus julius*, Rotterdam Zoo.
? Trichodopeostus aculeatus (Piaget), 1880 †. Straggler on *Momotus lessoni*.

20. **Nothocercus bonapartei** (G. R. Gray).

Nothocotus parvithorax Carriker, 1936. On *Nothocercus bonaparti* from Venezuela.
Heptapsus nothocercæ Carriker, 1936. Same data.

21. **Crypturellus cinereus cinereus** (Gmelin).

Heterogoniodes clypeiceps (Giebel), 1874. On *Crypturus cinereus*.

22. **Crypturellus cinereus cinerascens** Carriker.

Strongylocotes abdominalis Carriker, 1936. On *Crypturellus cinereus cinerascens* from Bolivia.
Heptapsogaster temporalis femininus Carriker, 1936. Same data.
Hypocryptus coniceps heterurus Carriker, 1936. Same data.

23. **Crypturellus berlepschi berlepschi** (Rothschild).

Megaginus emarginatus sordidus Carriker, 1936. On *Crypturellus b. berlepschi* from Colombia.
Heterogoniodes heterurus Carriker, 1936. Same data.

24. **Crypturellus berlepschi macconelli** (Brabourne & Chubb).

Pseudolipeurus subsimilis macconelli Clay, 1937. On *Crypturellus berlepschi macconelli* from British Guiana.

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* Evidently a slip; all the other localities Carriker gives for *N. n. nigrocapillus* are in Bolivia, and on p. 182 he records the *Heptapsus* from both subspecies, though he does not do so in the main text.

† True host possibly as above; see Carriker (1936).

25. **Crypturellus obsoletus punensis** (Chubb).

Pseudophilopterus hirsutus obsoletus Carriker, 1936. On *Crypturellus obsoletus pumensis* from Bolivia.

Nirmocotes nirmoides Carriker, 1936. On *Crypturellus obsoletus punensis* from Peru.

Physconella hamata hamata Carriker, 1936. On *Crypturellus obsoletus punensis* from Bolivia.

Megaginus emarginatus emarginatus Carriker, 1936. Same data.

Rhopaloceras brevitemporalis Carriker, 1936. Same data.

Hypocryptus coniceps obsoletus Carriker, 1936. Same data.

26. **Crypturellus obsoletus obsoletus** (Temminck).

Pseudolipeurus longipes (Piaget), 1880. On *Tinamus obsoletus*, Leyden Mus.

Strongylocotes complanatus complanatus (Piaget), 1880. On *Tinamus obsoletus*, Rotterdam Zoo.

Heptapsogaster stultus stultus Clay, 1937. On *Crypturellus o. obsoletus* from Argentina.

27. **Crypturellus soui panamensis** (Carriker).

Physconella kelloggi (Paine), 1913 *. Straggler on a dove, *Columbigallina talpacoti rufipennis* (Bonaparte) (*Chamæpelia rufipennis*, Panama).

28. **Crypturellus soui nigriceps** (Chapman).

Rhopaloceras rudimentarius Carriker, 1936. On *Crypturellus soui nigriceps* from Peru.

Hypocryptus coniceps coniceps Carriker, 1936. Same data.

29. **Crypturellus soui albigularis** (Brabourne & Chubb).

Strongylocotes subconiceps ambigularis Guimarães & Lane, 1937. On *Tinamus soui albigularis* from Brazil.

30. **Crypturellus soui inconspicuus** (Carriker).

Pseudolipeurus subsimilis Carriker, 1936. On *Crypturellus soui inconspicuus* from Bolivia.

Strongylocotes subconiceps Carriker, 1936. Same data.

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* True host probably as above; see Carriker (1936).

Physconella kelloggi subsimilis Carriker, 1936. Same data.

Megapeostus platycephalus platycephalus Carriker, 1936. Same data.

Hypocryptus coniceps inconspicuus Carriker, 1936. Same data.

31. **Crypturellus soui soui** (Hermann).

Cuclotogaster laticorpus Carriker, 1936. On *Crypturellus soui soui* from Venezuela.

Megapeostus platycephalus soui Carriker, 1936. Same data.

32. **Crypturellus undulatus yapura** (Spix).

Pseudophilopterus hirsutus hirsutus Carriker, 1936. On *Crypturellus undulatus yapura* from Peru.

33. **Crypturellus undulatus** (Temminck).

Pseudolipeurus macrogenitalis macrogenitalis (de Barros Netto), 1933. On *Crypturellus adspersus vermiculatus* [from Brazil].

Strongylocotes limai Guimarães, 1936 (part; see 34)*. On *Crypturellus undulatus vermiculatus* from Brazil.

34. **Crypturellus undulatus undulatus** (Temminck).

Pseudolipeurus macrogenitalis genitalis Carriker, 1936. On *Crypturellus u. undulatus* from Bolivia.

Strongylocotes limai Guimarães, 1936 (part; see 33). On *Crypturellus u. undulatus* from Matto Grosso, Brazil.

Heptapsogaster temporalis temporalis Carriker, 1936. On *Cryptuellus u. undulatus* from Bolivia.

Megapeostus asymmetricus asymmetricus Carriker, 1936. Same data.

Hypocryptus coniceps undulatus Carriker, 1936. Same data.

35. **Crypturellus boucardi boucardi** (P. L. Sclater).

Megapeostus multiplex multiplex Clay, 1937. On *Crypturellus b. boucardi* from Nicaragua.

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* Also stragglers on *Aramides saracura* (Spix) or possibly incorrect labelling.

36. **Crypturellus atrocapillus** (Tschudi).

Strongylocotes complanatus interruptus Carriker, 1936. On *Crypturellus atrocapillus* from Bolivia.

Physconella hama genitalis Carriker, 1936. Same data.

Heptapsogaster temporalis chiñirii Carriker, 1936. Same data.

Megapeostus asymmetricus parvigenitalis Carriker, 1936. Same data.

Discocorpus cephalosus Carriker, 1936. Same data.

Pectonosoma verrucosa angusta Carriker, 1936. Same data.

Kelloggia latithorax Carriker, 1936. Same data.

37. **Crypturellus variegatus variegatus** (Gmelin).

Strongylocotes lipogonus setosus (Piaget), 1880. On *Tinamus variegatus* *, Leyden Mus.

Heptapsogaster subdilatatus (Piaget), 1880. Same data.

Megapeostus fuscus Clay, 1937. On *Crypturellus v. variegatus* from British Guiana.

Pectenosoma verrucosa verrucosa (Taschenberg), 1882. On *Tinamus variegatus.*

Hypocryptus coniceps (Taschenberg), 1882. On *Tinamus variegatus.*

38. **Crypturellus variegatus salvini** (Salvadori).

Strongylocotes complanatus variegatus Carriker, 1936. On *Crypturellus variegatus salvini* from Peru.

39. **Crypturellus cinnamomeus mexicanus** (Salvadori).

Heptapsogaster temporalis acutiventris Clay, 1937. On *Crypturellus cinnamomeus mexicanus* from Mexico.

Megapeostus multiplex secundus Clay, 1937. On "*Perdris*" from Mexico.

Heterogoniodes arsæceps Clay, 1937. On *Crypturellus cinnamomeus mexicanus* from Mexico.

40. **Crypturellus cinnamomeus cinnamomeus** (Lesson).

Strongylocotes complanatus fimbriatus Clay, 1937. On *Crypturellus c. cinnamomeus* from Nicaragua.

* Possibly a straggler on this host; true host may be a *Rhynchotus.*

41. **Crypturellus noctivagus noctivagus** (Wied).

Strongylocotes complanatus noctivagi Clay, 1937. On *Crypturellus n. noctivagus* from Brazil.

Heptapsogaster stultus noctivagi Clay, 1937. Same data.

Heptapsus tergalis cylindratus Clay, 1937. Same data.

42. **Crypturellus tataupa tataupa** (Temminck).

Esthiopterum tataupa Carriker, 1936. On *Crypturellus t. tataupa* from Bolivia *.

Nirmocotes glabrous Carriker, 1936. On *Crypturellus t. tataupa* † from Brazil.

Nirmocotes orbicularis Carriker, 1936. Same data †.

Rhopaloceras pennaticeps (Paine & Mann), 1913. Straggler on *Anthus lutescens* †.

Heptapsogaster mandibularis Carriker, 1936. On *Crypturellus t. tataupa* from Brazil ‡.

Megapeostus petersi Carriker, 1936. Same data ‡.

Discocorpus microgenitalis Carriker, 1936. Same data ‡.

Pectenosoma verrucosa parva Carriker, 1936 Same data ‡.

Hypocryptus genitalis Carriker, 1936. Same data ‡.

43. **Rhynchotus rufescens rufescens** (Temminck).

Menacanthus arctifasciatus (Piaget), 1885. On *Rhynchotus rufescens* §, Hyslop Coll.

Oxylipeurus rhynchoti Carriker, 1936. On *Rhynchotus r. rufescens* ‖ from Bolivia.

Strongylocotes crassiceps (Rudow), 1869. On *Tinamus rufescens*.

Strongylocotes lipogonus lipogonus (Nitzsch in Giebel), 1866. On *Crypturus rufescens*.

Heptapsogaster dilatatus (Giebel), 1874. On *Rhynchotus rufescens*.

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* Almost certainly a straggler.

† True host as above; see Carriker (1936).

‡ In his list of new species Carriker (1936) gives the host as *Crypturellus t. tataupa*, whereas in the text he gives it as *Crypturellus tataupa*.

§ Probably a straggler on this host.

‖ Almost certainly a straggler on this host.

Rhynchothura sexpunctata (Piaget), 1885. On *Rhynchotus rufescens*, Hyslop Coll.

Tinamicola alatofasciata (Piaget), 1885. On *Rhynchotus rufescens*, Hyslop Coll.

Tinamicola dilatata (Rudow), 1870. On *Tinnamus bannaquira* *.

Tinamicola latithorax Carriker, 1936. On *Rhynchotus r. rufescens* from Bolivia.

Tinamicola rotundata (Rudow), 1869. On *Rhynchotus rufescens*.

Docophorocates sexsetosus (Piaget), 1885. On *Rhynchotus rufescens*, Hyslop Coll.

44. **Rhynchotus rufescens maculicollis** G. R. Gray.

Rhyncothura crenulata Carriker, 1936. On *Rhynchotus maculicollis* from Bolivia.

Rhyncothura lunulata Carriker, 1936. Same data.

45. **Nothoprocta cinerascens** (Burmeister).

Rhyncothura carrikeri Clay, 1937. On *Nothoprocta cinerascens* from Western Argentine (London Zoo).

46. **Nothoprocta curvirostris** Sclater & Salvin.

Heptapsogaster tesselatus tesselatus Carriker, 1936. On *Nothoprocta curvirostris* from Peru.

47. **Nothoprocta branickii** (Taczanowski).

Cuclotocephalus extraneus Carriker, 1936. On *Nothoprocta branickii* from Peru.

Heptapsogaster tesselatus truncatus Carriker, 1936. Same data.

Lamprocorpus hirsutus Carriker, 1936. Same data.

48. **Nothoprocta pentlandi** (G. R. Gray).

Cuclotocephalus secundus Carriker, 1936. On *Nothoprocta pentlandi* from Peru.

Lamprocorpus spinosus Carriker, 1936. Same data.

49. **Nothura maculosa peruviana** Berlepsch & Stolzmann.

Heptapsogaster testudo Clay, 1937. On *Nothura maculosa peruviana* from Peru.

Rhynchothura teres Clay, 1937. Same data.

* Taschenberg (1882) states that he had Rudow's types and that they were labelled as from *Rhynchotus rufescens*.

50. **Nothura maculosa nigroguttata** Salvadori.

Heptapsogaster minutus Carriker, 1936. On *Nothura maculosa nigroguttata* from Uruguay.

51. **Nothura boraquira** (Spix) *.

"Trinoton" biguttatum Rudow, 1866. On *Tinamus banaquira*. ? Straggler.
Strongylocotes ansata (Rudow), 1870. Same data.
Strongylocotes tinami (Rudow), 1870. Same data.
Tinamicola dilatata (Rudow), 1870. Same data.

52. **Tinamidæ**. Gen. et sp. ?

? Esthiopterum plumbeum † Pessôa & Guarmiães, 1935. On *Columba plumbea* (Vieill.) from Brazil.

[To be continued.]

LXIV.—*New Species of* Chrysomelidæ (*Coleoptera*) *from Africa.* By G. E. Bryant, F.R.E.S., Entomological Assistant, Imperial Institute of Entomology.

Eumolpinæ.

Macrocoma hargreavesi, sp. n. (Fig. 1.)

Deep bronze, clothed with short setæ, the antennæ and legs fulvous, the four apical segments of the antennæ and the apical half of the femora fuscous. Prothorax strongly and closely punctured, clothed with short adpressed setæ, the elytra strongly punctured, with short greyish setæ arranged in longitudinal rows, the anterior femora with a feeble tooth.

Length 2–2·50 mm.

Head closely punctured, deep bronze, clothed with short setæ, labrum black and impunctate, palpi fulvous. Antennæ short, extending to the base of the prothorax, fulvous with the four terminal segments fuscous, the

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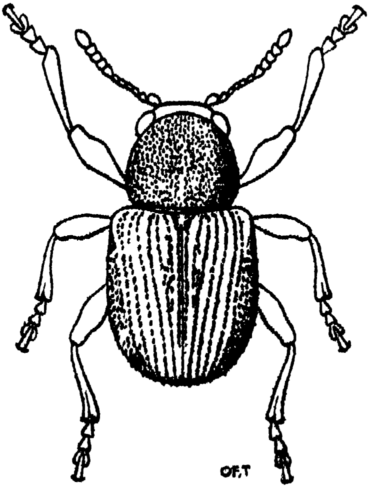
* See also no. 43. Rudow seems to have corrected this host-name to *Rhynchotus rufescens* in two intances, and possibly all the material was from the latter host.

† The description of this species was based on a single male. The authors state that it is related to *macrogenitale* de Barros Netto. If this is correct the species is a *Pseudolipeurus* and the host a Tinamou.

six basal more glabrous than the terminal, the 7th segment triangularly widened, the following three transverse, the apical segment longer and rounded at the apex. Prothorax bronze, subcylindrical, widest at the middle, strongly and closely punctured, clothed with short adpressed yellowish setæ. Scutellum subquadrate, punctured and clothed with short setæ. Elytra deep bronze, wider at the base than the prothorax, narrowed posteriorly, shoulders prominent, strongly and closely punctured, clothed with rows of yellowish setæ. Legs fulvous, the apical portion of the femora fuscous, strongly punctured, the anterior pair armed with a small tooth. Underside bronze, more finely and not so closely punctured as on the dorsal surface, clothed with fine greyish pubescence, the first ventral segment very long, about equal to the four following, which are all about equal. ♂ smaller than ♀.

Fig. 1.



Macrocoma hargreavesi, sp. n.

UGANDA: Bugomolo, 24. iv. 1927 (*H. Hargreaves*). Described from 37 specimens.

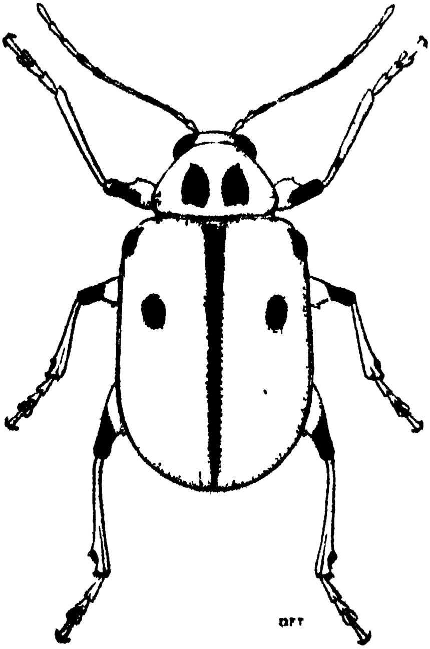
Type in the British Museum.

Closely allied to *M. apicicornis* Jac , from Mashonaland, but differs in its deep bronze colour, the head and prothorax with short setæ, not long whitish hairs, and the anterior femora being feebly dentate.

Syagrus hopei, sp n. (Fig. 2.)

Oblong, testaceous, nitid, with the head and prothorax almost smooth, two black patches on the disc of the prothorax. Elytra strongly punctate-striate, feebler at the apex ; suture black, two black spots on each elytron, one at the shoulder and one just before the middle, the basal two-thirds of the lateral margin black ; femora strongly dentate, the apical portion black.

Fig. 2.



Syagrus hopei, sp. n.

Length 5·50 mm.

Head testaceous, somewhat nitid, very finely and remotely punctured, the clypeus more strongly, a longitudinal median impression on the vertex. Antennæ long and slender, extending nearly to the middle of the elytra, the six basal segments flavous, the terminal segments fuscous, segments 3 to 6 longer and more slender than the first two, the five terminal segments slightly thicker than the preceeding, and all about equal. Prothorax testaceous with two black spots on the disc, nitid, a distinct row of punctures along the basal margin, the sides contracted in front. Scutellum testaceous, impunctate, nitid, subtriangular. Elytra broader at the base than the prothorax, rounded at the apex, testaceous with the suture black, a black spot on the shoulder, another before the middle, the basal two-thirds of the lateral margin black, strongly punctate-striate, the punctures towards the apex feebler. Legs with the femora strongly toothed, the apical portion of all the femora black. Underside testaceous, the meso- and metasterna slightly fuscous, the first two ventral segments tinged with fuscous, and all with rather long scarce pubescence.

S. Rhodesia : Hope Fountain, 2. xii. 1921, 3. xii. 1922 (*Rev. N. Jones*). Described from two specimens.

Type in the British Museum. Paratype in Rhodesian Museum.

Allied to *S. bipunctatus* Wse., but easily distinguished by the punctured clypeus and the black pattern of the elytra.

HALTICINÆ.

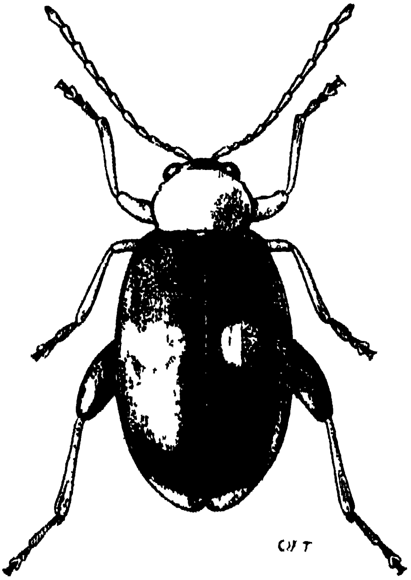
Jamesonia ornatipennis, sp. n. (Fig. 3.)

Oblong, flavous, base of the head and posterior legs, except at the base, black, the elytra metallic blue with a median transverse flavous band interrupted at the suture, the apical portion flavous.

Length 3 mm.

Head impunctate, the basal half black, the labrum and clypeus flavous, a longitudinal carina between the insertion of the antennæ. Antennæ flavous, extending to the middle of the elytra, the two basal segments more swollen, the first nearly twice as long as the second, the third narrower, about as long as the first, the terminal segments each about equal to the third and slightly more pubescent. Prothorax flavous and impunctate, subquadrate, the sides feebly rounded, the anterior angles oblique. Scutellum flavous, impunctate, triangular. Elytra metallic blue, very finely punctured, each with a median transverse flavous band interrupted at the suture, the apical portion flavous. Legs: the anterior and intermediate pairs flavous, the posterior pair black, the basal third of the femora flavous with very fine sparse grey pubescence, the tarsi fulvous, the posterior tibiæ armed with a short fulvous spur at the apex. Underside flavous, ventral segments of the abdomen finely punctured, 2nd to 4th about equal, 5th longer and notched in the ♂.

Fig. 3.



Jamesonia ornatipennis, sp. n.

UGANDA: Bukasa Isle, 16. xii. 1927 (*H. Hargreaves*); Maragoli, x. 1924 (*Dr. Van Someren*); Victoria Nyanza, Buddu, 3,700 ft., 19. ix. 1911 (*S. A. Neave*). Described from 14 specimens.

Type in the British Museum.

Allied to *J. femoralis* Jac., but smaller and easily distinguished by its pattern, which is quite constant in the series before me.

Cercyonia vittata, sp. n.

Subelongate and subcylindrical, fulvous, the head and prothorax greenish black with a metallic tinge, elytra with the suture, side margins and two vittæ black, strongly punctate striate.

Length 2·50 mm.

Head greenish black with a metallic tinge, finely punctured. Antennæ widely separated, fulvous, the three basal segments more glabrous, the first segment not quite equal to the 2nd and 3rd together, the terminal segments triangularly widened from the 4th, extending just beyond the base of the elytra. Prothorax very transverse, the sides obliquely narrowed towards the apex, the anterior angles well marked, the surface finely and closely punctured, entirely greenish black and with the side margins fulvous. Scutellum black, impunctate triangular. Elytra fulvous, the suture, side margins, and shoulders blackish, two blackish vittæ on each, one between the 3rd and 4th striæ, another between the 5th and 6th, not extending to the base or apex, striæ strongly punctured, the intervals slightly convex. Legs fulvous, the posterior femora very incrassate. Underside fulvous, the metasternum tinged with black.

Kenya Colony: Lamul, iv. & v. 1936 (*H. J. A. Turner*); Lower Tana, Sabaki, iv. & v. 1932 (*Turner & McArthur*). Described from 7 specimens.

Type in the British Museum.

Not closely allied to *C. usambarica* Wse., shorter, broader, and vittate.

Jamesonia keniæ, sp. n.

Oblong, black, with the elytra pale brown, head almost impunctate, a few fine punctures at the base, prothorax finely punctured, the elytra irregularly punctured.

Length 4–5 mm.

Head black nitid, a few fine punctures at the base, a short longitudinal carina between the insertion of the antennæ, a transverse sulcus between the eyes near the base, head with the eyes a little narrower than the prothorax. Antennæ black, extending beyond the base of the elytra, the three basal segments glabrous, the remainder pubescent, the 1st segment slightly longer than the 2nd and 3rd together, the 2nd and 3rd very short and equal to each other in the ♂, in the ♀ the 3rd not so rounded and narrower than the 2nd, the 4th very long, equal to the first three, the remainder broader and almost triangular in the ♂, and all pubescent. Prothorax black, nitid finely and closely punctured, subquadrate, the sides feebly rounded, the anterior angles prominent and slightly oblique. Scutellum black, glabrous triangular. Elytra pale brown, closely and irregularly punctured, slightly widened behind the middle, rounded to the apex. Legs black, clothed with short grey pubescence, the posterior tibiæ with a flavous spur. Underside black clothed with short pubescence.

KENYA: Mt. Kenya, 8,000 ft., xii. 1934 (*A. F. J. Gedye*); West Aberdares, 9–11,000 ft., vi. 1934 (*H. J. A. Turner & A. F. J. Gedye*). Described from 1 ♂, 6 ♀♀.

Type in the British Museum.

Not closely allied to a described species, but may be placed in the group *J. nigripennis* Jac. and *J. semicuprea* Bry.

LXV.—*New and interesting* Acrididæ (*Orthoptera*) *from Mauretania*. By B. P. UVAROV, D.Sc.

EXTENSIVE investigations were carried out during the recent years in the French Sahara by the Mission d'Etudes de la Biologie des Acridiens with a view to elucidating the distribution and ecology of the desert locust (*Schistocerca gregaria* Forsk.) and locating the areas which should be considered as centres of origin of locust swarms. While excellent results in that direction were obtained, members of the Mission, Dr. B. N. Zolotarevsky and Mr. M. Murat, have also made most valuable contributions to the knowledge of the geography, climate, vegetation, and fauna of some areas which remained practically unstudied. Of particular interest was the work of the Mission during 1936–1937, when the coastal areas and the interior of Mauretania were investigated, that part of the Sahara being both little known and very distinct from the vast tracts of the desert farther to the east.

On this occasion, as always, the Mission paid special attention to collecting Acrididæ, and an excellent faunistic collection, with ecological notes, was made. While a full report on the collection will be made by Dr. B. N. Zolotarevsky elsewhere, I am very pleased to have his kind permission to publish here the descriptions of some new and less known species collected by the Mission.

A detailed description of the country where the specimens were collected has been published by Zolotarevsky and Murat (Bull. Soc. Hist. Nat. Afrique du Nord, xxix. 1938, pp. 29–104, 8 pls., 1 map).

The types of the new species will be deposited in the Museum d'Histoire Naturelle, Paris, and paratypes, when available, also in the British Museum (Natural History).

Sphingonotus strepens, sp. n.

♂. Under medium size, slender, body with fine hairs. Antennæ slender, longer than head and pronotum together.

Head moderately projecting above pronotum. Face and cheeks with scattered shallow punctures. Frontal ridge in profile weakly convex, oblique; surface weakly convex between antennæ and concave at the ocellum; the ridge obsolescent halfway between ocellum and clypeus. Fastigium of vertex moderately sloping, longer than wide, punctured, with a median carinula; maximum width of vertex subequal to that of the frontal ridge between antennæ. Foveolæ of vertex distinct, punctured. Eyes oval; their vertical diameter about 1·5 the horizontal one and greater than the subocular distance.

Pronotum distinctly constricted in prozona. Transverse furrows deep; their interspaces distinctly gibbose; first furrow in the middle of prozona; third furrow at one-third of the total length. Median carina low but acute in front of the first furrow, obsolete between furrows, linear and somewhat irregular in metazona. Surface of metazona with fine anastomosing wrinkles; posterior angle obtuse, its margins weakly concave and very slightly wavy. Lateral lobe much shorter than deep; lower margin weakly ascending; posterior angle broadly rounded.

Sternum shiny, with a few very fine punctures. Mesosternal interspace twice as wide as it is long.

Elytra almost parallel-sided, extending to the apex of hind tibiæ; their length about five times the maximum width. Venation rather sparse; apical part of the second branch of the medial vein gives off three branches; intercalary vein distinctly S-shaped, almost touching the discoidal vein at the apex, very finely tuberculate in the apical portion only. Wings broadly triangular, with the outer margin of the radial area distinctly concave; their length 1·42 their maximum width; principal veins distinctly incrassate; median area (of Saussure) distinctly narrowed in the middle.

Posterior femur moderately slender, its length about 3·8 times its maximum width. Posterior tibia with eight outer and ten inner spines.

General coloration brown with reddish tinge. Face and cheeks bluish white. Antennæ with alternating brown and buff rings. Elytra with chocolate-brown spots in the basal third, in the middle, and in the apical third. Wings hyaline, iridescent, with a distinct infumate fringe along the outer margin which extends along the median area for some distance inwards; main veins and veinlets in the pre-radial area blackened. Hind femur on the inside black, with two well-defined light fasciæ. Hind tibia light blue, with black base and a light postbasal ring.

♀. Scarcely larger than the male and slightly more robust. Wings without the infumate fringe, but with principal veins and the veinlets in the pre-radial area and along the margin distinctly blackened.

Length of body, ♂ 17, ♀ 18; pronotum, ♂ 3·5, ♀ 4; elytra, ♂ 17, ♀ 19; hind femur, ♂ 9, ♀ 10 mm.

Described from one male (type, no. 215) and one female taken at Kedia Guengoum, Zemmour, N.E. Mauretania,

17. xi. 1936; and one male at Stal-Nagal, Zemmour, 15. xi. 1936.

According to Dr. B. N. Zolotarevsky this insect makes a strong rattling noise when flying; hence its specific name.

S. strepens exhibits a curious resemblance to *S. arabicus* Mistshenko ('Eos,' xii. 1936, p. 92), which hitherto was the only species with a marginal dark fringe on the wings. The venation of both the elytra and the wings, as well as the shape of the latter, are also very similar in *arabicus* and *strepens*. However, the two species differ well in the structure of vertex (broader and more sloping in *arabicus*), in the structure of pronotum, and in the coloration of the inside of hind femur (unifasciate in *arabicus*).

There appears to be some resemblance between *S. strepens* and *Helioscirtus fonti* described by I. Bolivar from Rio de Oro, but in that species the wings are said to be yellowish basally, with the principal veins of the same colour, while there is no mention in the description of the marginal dark fringe, which is a character impossible to overlook.

I include this species tentatively in the genus *Sphingonotus*, following Mistshenko's treatment of species with similarly modified wing venation, but I reserve my opinion as to the ultimate assignment of such species.

Anamesacris zolotarevskyi, sp. n.

♀. Antennæ very short (if extended backwards would scarcely reach beyond the occiput), stout and distinctly incrassate in the apical part.

Face and cheeks callously wrinkled and strongly punctured. Frontal ridge moderately expanded between antennæ, constricted under ocellum and weakly expanded towards the clypeus; its surface scarcely concave, strongly punctured; margins raised, rounded; viewed in profile the ridge between antennæ is weakly convex but not projecting forward. Fastigium of vertex very little projecting, hexagonal, strongly transverse, its surface weakly concave, with the transverse furrow very shallow and irregular. Head above with dense callous wrinkles and a thick, low, median carinula.

Pronotum less densely and more confusedly tuberculate than in *A. saharæ*; hind margin of metazona more deeply excised in the middle than in that species. Mesonotum, metanotum, pleuræ, and most of abdominal tergite with dense callous rugosities and punctures.

Prosternum distinctly incrassate, with a curved submarginal ridge.

All legs relatively short and thick. Hind tibia curved, armed with eight spines on each side (not counting the subapical spines); inner spines are curved and longer than the outer ones.

Coloration mottled with white, grey, brown, and blackish. Hind femur with three blackish fasciæ above. Hind tibia pale buff, with the inner spines red, outer ones yellow, and all black-tipped.

Length of body 18; pronotum 3·6; hind femur 8·5 mm.

Described from a single female (type, no. 218) taken at Kedia Guengoum, Zemmour, 12. xi. 1936.

The genus *Anamesacris* was erected by me in 1934 (Ann. & Mag. Nat. Hist. ser. 10, vol. xiv. p. 467) to include a remarkable grasshopper discovered by M. Rungs in Tafilalet, in the Moroccan Sahara, and it is a great pleasure for me to be able to study another species of this peculiar genus. The new species differs from *A. saharæ* by the distinctly shorter antennæ, by the frontal ridge not projecting forward between antennæ and scarcely expanded below the ocellum, by the fastigium less projecting and more transverse, by shorter and thicker hind femora and tibiæ, the latter bearing fewer spines (nine externally and eleven internally in *A. saharæ*), which are also differently coloured. In general appearance the new species differs by its smaller size, more robust build, and mottled coloration. In other respects, including the peculiar shape of the pronotal median carina, both species are very similar.

A second species of *Anamesacris* has been described recently by I. Bolivar from the Spanish territory of Ifni in Morocco ('Eos,' xi. 1935, p. 410), but it differs strongly from *A. saharæ* and *A. zolotarevskyi* in smaller size, oblique frons, projecting fastigium, and the shape of pronotal carina. In all these respects, *A. ifniensis* I. Bol. approaches my genus *Pamphagulus*, and should be perhaps better referred to it.

It is interesting to note a parallelism between species of *Dericorys* and *Anamesacris*. In the former genus there is a group of relatively slender species, e. g., *D. millierei* with the posterior tibiæ bearing numerous spines, as is the case with *A. saharæ*. Another group includes the species like *D. lobata* Bru. and *D. bolivari* Kr., which are of sturdy habitus and with reduced number of tibial spines; to this group corresponds our new *Anamesacris zolotarevskyi*.

The males in the genus *Anamesacris* remain unknown; they should be much smaller than females.

Dericorys lobata bolivari Krauss, 1892.

1886. *Dericorys lobata* Bolivar, An. Soc. Esp. Hist. Nat. xv. p. 516 (*nec* Brullé !).
1892. *Dericorys bolivari* Krauss, Zool. Anz. xv. p. 168 (footnote).
1893. *Dericorys bolivari* Bolivar, Actas Soc. Esp. Hist. Nat. xxii. p. 50.

This insect has been recorded by I. Bolivar from Rio de Oro under the name *D. lobata*, which was given by Brullé to a species from the Canary Islands. Since I. Bolivar has at the same time indicated some characters of his insect, the name *bolivari* proposed for it by Krauss should be considered valid, although Krauss himself gave no description at all.

In a later paper I. Bolivar recognized *bolivari* as distinct from the Canarian *lobata*, and gave a brief comparative description of both. Unfortunately he did not take into account the possibility that different species or forms may occur on the various islands of the Canary archipelago. His conception of *lobata* was based on a specimen (or specimens) from the Fuerteventura Island, while Brullé himself did not specify the exact origin of his species. I have before me three females from Graciosa and one from Fuerteventura (all taken in September 1931 by H. B. Cott), and they are sufficiently distinct to be separated subspecifically. Moreover, the Graciosa form agrees in the coloration of posterior tibia with the female type of *lobata* preserved in the Paris Museum and kindly examined for me by Dr. L. Chopard. I feel, therefore, justified in restricting *lobata* to the form occurring in Graciosa, while the Fuerteventura one has to be given a distinct subspecific name. The form occurring in Rio de Oro is known to me from a single discoloured male in the British Museum collection and two pairs from Guerguerat, Cap Blanc, Mauretania, 28–29. i. 1937, collected by the Mission d'Etudes de la Biologie des Acridiens. This form is clearly distinct from both the Graciosa and the Fuerteventura ones, but the differences are not sufficient, in my opinion, to be regarded as specific. I believe, therefore, that the species *D. lobata* should be divided into three subspecies, that may be separated by the following key :—

1 (4). Head practically smooth. Pronotum with moderately dense, low and rounded tubercles ; posterior angle of metazona very acutely attenuated. Hind femur more slender and less strongly serrate on the edges. Elytra moderately narrowed apically.

2 (3). Posterior tibia in the female dirty sanguineous, with bright yellow base ; spines yellow or orange-yellow. Elytra with a distinct pale streak in the basal part of pre-radial area. (Graciosa.)........... *lobata.*

3 (2). Posterior tibia uniformly honey-yellow ; spines of the same colour. Pre-radial pale streak of the elytra indistinct. (Fuerteventura : typo, a female in the British Museum, ix. 1931, *H. B. Cott.*) .. *luteipes*, subsp. n.

4 (1). Head distinctly ruguloso and punctured. Pronotum with dense, subacute, and well-raised tubercles ; posterior angle of metazona less attenuated, subobtuse. Hind femur short and thick, its edges strongly serrate. Elytra strongly narrowed apically. Posterior tibia in the female yellow, with orange-yellow spines ; in the male whitish yellow in the basal third and at the apex, greyish black in the rest ; inner spines light red, outer ones pale pink, all black-tipped. (Rio de Oro, Mauretania.)....................... *bolivari.*

According to Krauss (*l. c.* 1892) the species occurs also on the islands of Montaña Clara and Alegranza, where it may be represented by distinct subspecies, but I have not seen specimens from those islands.

The dimorphism in the coloration of posterior tibiæ in *D. lobata bolivari* is very striking, but no males of the other two subspecies are known (the male co-type of *D. lobata lobata* is said to be discoloured), and this may be a character common to all of them.

Dericorys murati, sp. n.

Size under medium for the genus ; habitus slender.

♂. Antennæ about as long as head and pronotum, slightly incrassate apically.

Face moderately oblique. Frontal ridge, viewed in profile, between antennæ rounded but not prominent; viewed from the front it is distinctly widened between antennæ, narrowed under ocellum, and weakly widened towards the clypeus; surface sulcate, margins raised. Fastigium of vertex sloping, parallel-sided, with a weak median carinula.

Pronotum distinctly saddle-shaped. Submarginal furrow distinct. Median keel thick, in profile obtusely rounded. Prozona practically smooth, metazona rugulose, with raised shoulders and distinctly raised median keel; hind angle obtuse, not rounded.

Prosternal tubercle tongue-shaped, acute. Mesosternal lobes longer than broad, with the inner angles rounded; their interspace strongly narrowed behind, where its width is about half that at the anterior margin. Sternum punctured.

Elytra narrow, extending well beyond hind knees.

Hind tibia distinctly curved, with 10 outer and 11 inner spines.

General coloration brownish grey, with the usual grey and whitish pattern. Elytra with an interrupted whitish pre-radial stripe. Wings hyaline, with brownish veins. Hind tibia testaceous, with the apical third and two premedian fasciæ of greyish colour; spines red, black-tipped.

♀. Sternum strongly punctured and rugulose. Hind tibia bluish grey, whitish at the base.

Length of body, ♂ 17, ♀ 29; pronotum, ♂ 4, ♀ 6; elytra, ♂ 18, ♀ 26; hind femur, ♂ 11, ♀ 16 mm.

Described from one male (type, no. 863) and one female (paratype, no. 862) taken at Louten, Tasiast, 4. ii. 1937; and one female (paratype, no. 1096) from the Ile de Tidra, 25. ii. 1937.

This new species is very similar at first sight to *D. johnstoni* recently described by me from the Red Sea coast of Sudan (Ann. & Mag. Nat. Hist. ser. 10, vol. xi. 1933, p. 251), but differs from it by the pronotal carina rounded in profile in both sexes (angular in the male of *D. johnstoni*), by the punctured and rugulose sternum, but particularly by the mesosternal interspace being strongly narrowed behind. While these characters are amply sufficient to separate the two species, it is certainly of interest that such closely allied forms occur symmetrically in the two coastal areas of the great African desert.

LXVI.—*The Piaget Collection of Mallophaga.*—Part V.

By Gordon B. Thompson.

[Continued from p. 343.]

Species.	No. of specimens in B.M.	No. of slides.	Hosts.
Docophorus acuminatus Piaget ...	1 ♀.	1	*Podoa senegalensis.*
D. alatoclypeatus Piaget	7 ♀♀, 1 ♂.	3	*Dacelo cinereifrons.*
D. albidus Piaget..............	2 ♀♀, 2 ♂♂.	2	*Corvus scapulatus.* *Corvus crassirostris.*
D. albidus var.	2 ♀♀, 1 ♂.	2	*Corvus rostratus.*
D. alcedinis Denny	3 ♀♀.	2	*Alcedo ispida.*
D. angulatus Piaget	1 ? ♀ or ♂.	1	? Host.
D. angustoclypeatus Piaget	2 ♀♀, 2 ♂♂.	2	*Platycercus barrabandi.*
D. antennatus Piaget	1 ♀, 1 ♂.	1	*Dromas ardeola.*
D. assimilis Piaget	1 ♀.	1	*Paradisea chalybæa.*
D. atratus Nitzsch in Denny	7 ♀♀, 4 ♂♂.	6	*Corvus frugilegus.* *Corvus corone.* *Corvus dauricus.* *Cuculus canorus.*
D. auratus Nitzsch in Burmeister.	2 ♀♀, 1 ♂.	2	*Scolopax rusticola.*
D. bassanæ Denny	12 ♀♀.	6	*Sula alba.* *Sula bassana.*
D. bipustulatus Piaget	1 ♀ [*].	1	*Ardea egretta.*
D. bisetosus Piaget	3 ♀♀, 2 ♂♂.	2	*Mergus serrator.*
D. breviantennatus Piaget	2 ♀♀.	1	*Sula australis.*
D. brevimaculatus Piaget	1 ♀.	1	*Bernicla brenta.*
D. buphthalmus Piaget	1 ♀.	1	*Sterna* sp. ?
D. celebrachys Nitzsch in Denny ..	13 ♀♀, 8 ♂♂. 6 imm.	12	*Strix noctua.* *Strix brachyotus.* *Strix flammea.* *Brachyotus europæus.*
D. celedoxus Nitzsch in Burmeister.	1 ♀.	1	*Alca torda.*
D. cephaloxys Nitzsch in Giebel ..	2 ♀♀.	2	*Alcedo ispida.*
D. cephalus Denny	1 ♀, 1♂.	1	*Calidris arenaria.*
D. claviformis Piaget	2 ♀♀.	1	*Pitta* sp. ? (Philippines).
D. colymbinus Denny	2 ♀♀.	1	*Colymbinus septentrionalis.*
D. communis Nitzsch in Burmeister.	7 ♀♀, 5 ♂♂.	8	*Motacilla alba.* *Bombycilla garrula.* *Phasianus pictus* (Celebes). *Sylvia* sp. ? *Sylvia turdoides.* *Fringilla carduelis.* *Emberiza citrinella.*
D. communis var. *cardinalis* Piaget	5 ♀♀.	3	*Cardinalis cuculata.*
D. communis var. *passeris* Piaget.	6 ♀♀, 2 ♂♂. .	5	*Passer domesticus.*
D. communis var. *ornata* Nitzsch .	2 ♀♀.	1	*Oriolus galbula.*

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[*] The measurements of a male are given with the original description, but there is no male in the collection.

Species.	No. of specimens in B.M.	No. of slides.	Hosts.
D. communis var. *rubeculæ* Piaget	3 ♀♀, 1 ♂.	2	*Emberiza nivalis*.
D. communis var. *pyrrhulæ* Piaget	4 ♀♀, 1 ♂.	2	*Pyrrhula vulgaris*. *Ciconia alba*.
D. compar Piaget	2 ♀♀, 2 ♂♂, 2 imm.	3	*Loxia curvirostris*
D. congener var. *magna* Piaget	1 ♀, 1 ♂.	1	*Larus atricilla*.
D. continuus Piaget	2 ♀♀, 2 ♂♂.	2	*Porphyrio smaragdinus* (Java).
D. cordiceps Giebel	5 ♀♀, 4 ♂♂, 4 imm.	7	*Totanus hypoleucus*. *Totanus fuscus*. *Totanus latirostris*. *Vanellus cristatus*. *Strepsilas interpres*.
D. crassipes Nitzsch in Burmeister.	5 ♀♀, 4 ♂♂, 4 imm.	5	*Nucifraga caryocatactes*.
D. cursitans Nitzsch in Giebel	7 ♀♀.	3	*Strix passerina*.
D. cursor Nitzsch in Burmeister	6 ♀♀, 6 ♂♂.	8	*Strix brachyotus*. *Strix otus*. *Strix aluco*. *Athene noctua*.
D. cygni Denny	7 ♀♀, 6 ♂♂.	6	*Cygnus musicus*. *Cygnus olor*. *Cygnus atratus*.
D. depressus Piaget	1 ♀ *.	1	*Malaconotus icterus*.
D. duplicatus Piaget	4 ♀♀, 1 ♂.	2	*Ceryle rudis*.
D. dubius Piaget	1 ♀.	1	"Xulla mangola" †.
D. elongatus Piaget	3 ♀♀, 3 ♂♂.	3	*Rhynchops flavirostris*.
D. emarginatus Piaget	1 ♀ ‡.	1	*Ibis peregrina*.
D. eurygaster Giebel	2 ♀♀, 2 ♂♂.	2	*Buteo lagopus*.
D. excisus Nitzsch in Burmeister	1 ♂, 1 ♀, 4 imm.	4	*Cypselus apus*. *Hirundo urbica*. *Perdix coturnix* §. *Sylvia phœnicurus* §.
D. extraneus Piaget	1 ♀, 1 ♂.	1	*Corvus macrorhynchus*.
D. femoratus Piaget ‖	1 ♀.	1	*Dacelo princeps*.
D. forficula Piaget	7 ♀♀, 7 ♂♂, 5 imm.	9	*Platycercus eximius*. *Platycercus barrabandi*. *Platycercus baueri*. *Platycercus pennanti*.

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* According to the original description it seems that Piaget had other specimens of this species.

† I have previously pointed out that this is a locality and not the name of a host.

‡ A male is mentioned in the original description, but there is no male in the collection.

§ The determination of the immature specimens from these hosts is queried on the label.

‖ I take this species to be Piaget's var. of *D. leontodon*.

Species.	No. of specimens in B.M.	No. of slides.	Hosts.
			Platycercus scapulatus. *Pyrrhocorax alpinus.*
D. forficuloides Piaget	1 ♂ *.	1	*Alcedo* sp. ? (Java).
D. fulvus Nitzsch in Giebel	4 ♀♀, 2 ♂♂.	3	*Garrulus glandarius.*
D. fuscicollis Nitzsch in Burmeister †.	4 ♀♀, 2 ♂♂.	4	*Lanius excubitor.*
D. fusiformis Denny	3 ♀♀, 1 ♂.	2	*Tringa subarquata.* *Tringa canutus.*
D. gonorhynchus Giebel	9 ♀♀, 2 ♂♂.	7	*Buteo vulgaris.* *Buteo bidentatus.* *Nisus communis.* *Nisus radiatus.* *Milvus ægypticus.* *Falco subbuteo.*
D. guttatus Nitzsch in Denny	1 ♀, 1 ♂.	1	*Corvus monedula.*
D. hamatofasciatus Piaget	1 ♀.	1	*Penelopides manillæ*
D. hians Giebel	1 ? ♀ ‡.	1	*Ibis rubra.*
D. hirundinis Piaget	2 ♀♀, 2 ♂♂.	2	*Cypselus apus.* *Hirundo rustica*
D. icterodes Nitzsch in Burmeister.	29 ♀♀, 13 ♂♂, 3 imm.	18	*Anas clangula.* *Anas crecca.* *Anas tadorna.* *Anas leucophthalmus.* *Mareca penelope.* *Anser albifrons* *Anser ægypticus.* *Podiceps cristatus.* *Somateria mollissima* "Cygne domestique." *Cygnus musicus.* *Mergus albellus.*
D. incompletus Nitzsch in Denny	4 ♀♀, 4 ♂♂.	4	*Ciconia alba.*
D. indicus Piaget	3 ♀♀, 3 ♂♂.	3	*Tantalus lacteus.*
D. intermedius Piaget	3 ♀♀, 2 ♂♂.	3	*Asturina nitida.* *Haliaëtus vociferoides.*
D. jugens Kellogg	1 ♀.	1	*Colaptes auratus* (Kansas).
D. lari Fabricius	18 ♀♀, 17 ♂♂, 4 imm.	15	*Larus argentatus.* *Larus ridibundus.* *Larus canus.* *Larus glaucus.* *Larus marinus.* *Larus ichthyaëtos.* *Larus fuscus.* *Accipiter nisus.* *Sula alba.*
D. larus var. *parva* Piaget	2 ♀♀, 2 ♂♂.	2	*Larus dominicanus.* *Larus crassicornis.*

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* A female is mentioned in the original description, but there is no female in the collection.

† This species is referred to as a var. of *D. communis* in the 'Monograph.'

‡ A male is mentioned in the original description.

Species.	No. of specimens in B.M.	No. of slides.	Hosts.
D. laricola Nitzsch in Giebel	4 ♀♀, 4 ♂♂.	5	*Sterna minuta.* *Sterna nigra.* *Sterna hirundo.*
D. latifrons Nitzsch in Denny	5 ♀♀, 5 ♂♂.	5	*Cuculus canorus.*
D. laticlypeatus Piaget	1 ♀.	1	*Cuculus flabelliformis* (Nov. Holl.).
D. leontodon Nitzsch in Burmeister.	7 ♂♂, 4 ♀♀, 4 imm.	5	*Sturnus vulgaris.* *Columba domesticus.*
D. leontodon var. *affinis* Piaget	3 ♀♀, 1 ♂.	2	*Sturnus cristatellus.*
D. leontodon var. *gracula* Piaget	3 ♀♀, 1 ♂.	2	*Gracula religiosa.*
D. leontodon var. *subacuta* Piaget	2 ♀♀.	1	*Lamprotornis* sp. ?
D. leucogaster Giebel	4 ♂♂.	2	*Buteo jackal.*
D. limbatus Piaget	1 ♀.	1	*Megalæma corvina.*
D. limosæ Denny	1 ♀, 1 ♀.	1	*Limosa melanura.*
D. lobaticeps Giebel	3 ♀♀, 3 ♂♂.	3	*Sterna* sp. ? *Sterna gracilis.* *Sterna hirundo.*
D. longiceps Piaget	3 ♀♀, 2 ♂♂.	2	*Brachypteracias leptosomus.*
D. longiclypeatus Piaget	1 ♀.	1	*Sittace mucao.*
D. macrocephalus Nitzsch in Giebel	3 ♀♀, 3 ♂♂.	3	*Haliastur indus.*
D. maculipes Piaget	1 ♀.	1	*Picus* sp. ? (Bangka).
D. melanocephalus Nitzsch in Burmeister.	4 ♀♀, 4 ♂♂.	4	*Sterna cantiaca.* *Sterna hirundo.*
D. merulæ Denny *	7 ♀♀, 2 ♂♂.	3	*Turdus pilaris.*
D. nudipes Piaget	2 ♀♀, 1 ♂, 2 imm †.	2	*Brachyotus europæ.* *Otus madagascarensis.*
D. obcordatus Piaget	1 ♀.	1	*Scythrops novæhollandiæ* (Celebes).
D. ocellatus Scopoli ‡	2 ♀♀, 2 ♂♂, 3 imm.	3	*Corvus corone.* *Corvus cornix.*
D. ornatus Nitzsch §	1 ♀, 1 imm.	2	*Oriolus galbula.*
D. ostralegi Denny	7 ♀♀, 3 ♂♂, 4 imm.	5	*Hæmatopus ostralegus.*
D. paraboliceps Piaget	1 ♂.	1	*Menura lyra.*
D. pertusus Nitzsch in Burmeister.	1 ♂.	1	*Fulica atra.*
D. picæ Denny	2 ♀♀.	1	*Corvus pica.*
D. pilosus Piaget	6 ♀♀, 5 ♂♂.	5	*Phœnicopterus antiquorum.*
D. platalex Denny	11 ♀♀, 3 ♂♂.	5	*Sterna cantiaca.* *Platalea leucorodia.*
D. platyclypeatus Piaget	1 ♀.	1	*Anastomus lamelligerus.*
D. platystomus Nitzsch in Burmeister.	6 ♀♀, 3 ♂♂.	4	*Haliaëtus indus* (Sumatra). *Buteo vulgaris.* *Circus cinerascens.*
D. platystomus var. Piaget	3 ♀♀, 3 ♂♂.	3	*Haliaëtus indus* (Sumatra).

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* This species is given as a var. of *communis* in the 'Monograph.'

† The determination of the immature specimens is queried on the label.

‡ Piaget gives Nitzsch as the author of this species.

§ This species is given as a var. of *communis* in the 'Monograph.'

Species.	No. of specimens in B.M.	No. of slides.	Hosts.
D. protrusus Piaget	3 ♀♀, 2 ♂♂.	3	*Carpophaga bicolor.* *Eclectus puniceus.* *Eclectus sinensis.*
D. pustulosus Nitzsch in Giebel ..	2 ♀♀.	1	*Lestris spinicauda.*
D. pustulosus Nitzsch in Giebel ? .	2 ♀♀, 2 ♂♂*.	2	*Lestris pomarina.*
D. quinquemaculatus Piaget... .	1 ♀, 1 ♂.	1	*Hirundo urbica.*
D. rostratus Nitzsch in Burmeister.	3 ♀♀, 1 ♂.	2	*Strix flammea.*
D. rubeculæ Leach ?	3 ♀♀, 3 ♂♂.	3	*Fringilla cœlebs.*
D. scalaris Nitzsch in Burmeister.	1 ♂, 2 ♀♀.	2	*Picus viridis.* *Picus major.*
D. semivittatus Giebel	1 ♀ †.	1	*Charadrius* sp. ?
D. serrilimbus Nitzsch in Burmeister.	8 ♀♀.	3	*Inyx torquilla.*
D. setifer Piaget....	3 ♀♀.	2 ‡	*Epimachus niger.* *Epimachus albus.*
D. setosus Piaget	2 ♀♀.	2	*Tropidorhynchus morotai.* *Alcedo* sp. ? (Bangka).
D. sphenophorus Nitzsch in Giebel.	3 ♀♀, 2 ♂♂.	3	*Platalea leucorodia.* *Ibis ? religiosa.* *Ibis religiosa.*
D. subalbicans Piaget	3 ♂♂, 5 ♀♀.	3	*Paradisea papuana.* *Paradisea rubra* §.
D. subalbicans var. Piaget	1 ♀, 1 ♂.	1	*Paradisea sexpennis.*
D. subcrassipes Nitzsch	4 ♂♂, 1 ♀.	2	*Corvus pica.*
D. subcrassipes var.	2 ♀♀, 2 ♂♂.	2	*Pica leucoptera.*
D. sulcatus Piaget	1 ♀.	1	*Ardea blongias.*
D. superciliosus Nitzsch in Burmeister.	10 ♀♀, 3 ♂♂.	6	*Picus major.* *Picus viridis.*
D. temporalis Giebel	4 ♀♀, 1 ♂.	3	*Vanellus cristatus.*
D. testudinaris Denny	5 ♀♀, 4 ♂♂..	5	*Numenius arquata.*
D. trabecula Piaget	2 ♀♀.	2	*Dicrurus retifer.* *Artamus leucocephalus* ‖.
D. tricolor Nitzsch in Burmeister.	3 ♀♀, 3 ♂♂.	3	*Ciconia nigra.*
D. truncatus Piaget	1 ♀.	1	*Aulacorhynchus cœruleogularis* (Toucan).
D. unifasciatus Piaget	1 ♀.	1	*Polyborus vulgaris.*
D. virilis Piaget................	4 ♀♀, 4 ♂♂.	4	*Polyborus vulgaris.*

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* These specimens were labelled by Piaget with a name which appears to be unpublished—the name *pustulosus* N. ? is also written on the label.

† The measurements of a male are given with the original description, but there is no male in the collection.

‡ One slide also contains a female of a species determined by Piaget as *M. crassipes*.

§ Specimens from this host are given as a var. in the 'Monograph,' but there is no indication on the label.

‖ The determination of the specimen from this host is queried on the label.

[To be continued.]

LXVII.—*On the Teeth of a new Elasmobranch from the Calciferous Sandstones of Glencartholm, Eskdale, Dumfriesshire.* By J. A. Moy-Thomas, M.A., Department of Zoology and Comparative Anatomy, Oxford.

[Plate XVIII.]

Since I gave an account of the Elasmobranch fishes from the Lower Carboniferous of Glencartholm, Eskdale, Dumfriesshire (Moy-Thomas, 1936), a further specimen of a new Elasmobranch from this locality has come to light in the Royal Scottish Museum, Edinburgh. The specimen (R.S.M. 1885–54–4) consists only of the teeth and a few scattered but unidentifiable fragments of cartilage. The dentition, however, is interesting, since it consists of several different types of Petalodont teeth, which resemble *Ctenopetalus* in having a denticulated cutting-edge, but also come within the genera *Chomatodus* (as defined by Newberry and Worthen, 1866), *Antliodus* Newberry and Worthen (1866), and *Tanaodus* St. John and Worthen (1875) in having short roots. It is notoriously difficult to identify complete dentitions generically, as most of the genera are founded on descriptions of single teeth. In this case, since all the teeth have short roots, I propose including them all in *Antliodus*, which will make *Tanaodus* and *Chomatodus* (as defined by Newberry and Worthen) synonyms of it. St. John and Worthen themselves suggested that this was probably the case. As it is possible to give a more exact definition of this species than of other species previously attributed to this genus, I have described it as a new species, *Antliodus scoticus*, sp. n.

There are about twenty teeth of four distinct types preserved. They are, however, unfortunately displaced, but there can be little doubt that they were arranged in much the same way as those of *Climaxodus* (Smith Woodward, 1920).

The mostelongated teeth (Pl. XVIII. figs. 1–3)are much laterally compressed, with a coarsely denticulated cutting-edge. The anterior face is strongly convex, its upper part divided from the lower by four or five transverse striæ. The upper part is ornamented with a few tubercles, the lower running uninterruptedly into the root, which is short and almost parallel with the surface of the upper anterior part. The posterior surface is only very slightly concave, ornamented with vertical rows of elongated tubercles, and ventrally it overhangs the root, which is separated from it by longitudinal striæ, which are continued up the tooth at one end. The ornamented posterior surface is nearly twice as deep as that of the anterior surface.

The second type of tooth (Pl. XVIII. figs. 4–6) is very similar to the first, but the tooth is relatively shorter and deeper, and the ornamented part of the anterior surface relatively deeper and more concave.

The third type of tooth (Pl. XVIII. figs. 7–9) is similarly ornamented but far less laterally expanded than those already described. It is higher than broad, the cutting-edge having smaller denticulations. The anterior surface is strongly convex, its ornamented part being about half the depth of the posterior, which is gently concave and overhangs the short root.

The fourth type of tooth (Pl. XVIII. figs. 10–12) is similar in shape and ornament to the third, but smaller, its cutting-edge being more finely denticulated. The ornamented anterior surface is relatively smaller and the posterior surface more concave.

I would like to express my thanks to Dr. E. I. White and Sir Arthur Smith Woodward for helping me with the generic identification of these teeth.

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EXPLANATION OF PLATE XVIII.

Figs. 1–12. *Antliodus scoticus*, sp. n. Anterior, posterior, and cross-sectional views of the teeth. × 5.

LXVIII.—*On a small Collection of Polychæta from Swan River, Western Australia.* By C. C. A. MONRO, Department of Zoology, British Museum (Natural History).

DR. D. L. SERVENTY recently had the kindness to send a small collection of Polychætes taken by him from Swan River, Western Australia. I suspect them of being estuarine and probably brackish-water forms, a conclusion to which the presence of *Mercierella enigmatica* points, but I have no information in regard to their habitat. I found no new species among them, but they seemed to me of sufficient interest to warrant a short note.

Family **Polynoidæ.**

Genus HARMOTHOË Kinberg.

Harmothoe waahli (Kinberg).

Augener, 1913, p. 112, pl. ii. fig. 9, with citations.
Monro, 1933 *a*, p. 489, figs. 1–3.

Occurrence.—Crawley Bay, Swan River, W. Australia (3); Swan River, W. Australia (1).

Remarks.—These specimens are unusual in having the elytra heavily fringed on the outer edge. They are also dotted with small spines. In fact, except for the forward position of the anterior eyes, these specimens might be justly attributed to *Harmothoë spinosa* Kinberg. Fauvel (1917, p. 180) discusses the relation of the two species, and in my view the difference between them does not deserve more than a subspecific or varietal status. Augener records *H. waahli* from Swan River.

Family **Nereidæ.**

Genus NEREIS Cuvier.

Nereis oxypoda Marenzeller. (Figs. 1–5.)

Marenzeller, 1879, p. 120, pl. ii. fig. 3.
Izuka, 1912, p. 171, pl. xviii. figs. 8–11.
Fauvel, 1933, p. 22.

Occurrence.—Crawley Bay, Swan River, W. Australia (1); Pelican Point, Swan River, W. Australia (3).

Description.—Of these specimens the largest measures 137 by 5 mm. without the feet for 130 chætigers, and the smallest 36 by 2 mm. without the feet for c. 100 chætigers.

Fig. 1.

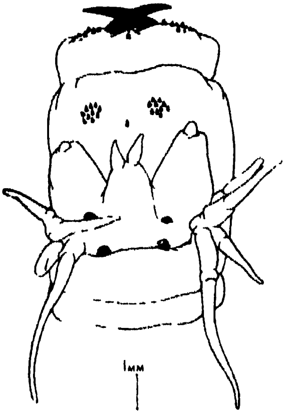


Fig. 2.

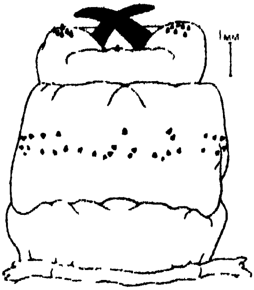


Fig. 3.

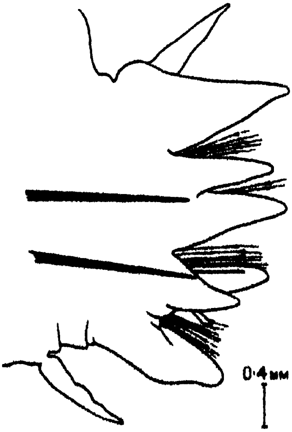
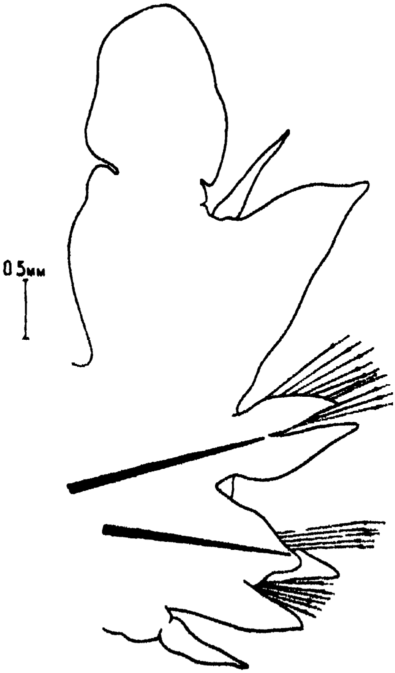


Fig. 4.

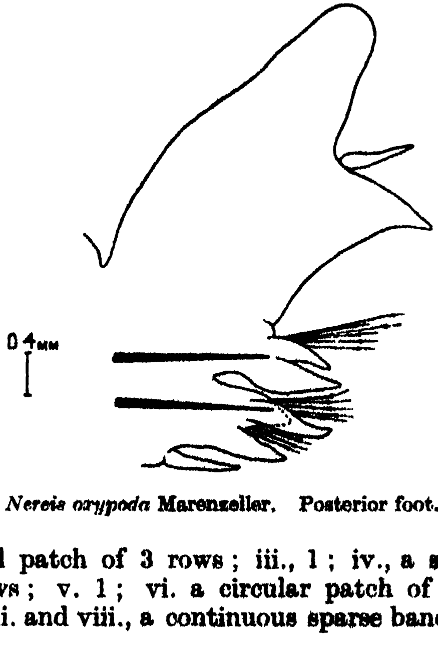


Nereis oxypoda Marenzeller.

Fig. 1.—Anterior end from above. (× ½.)
Fig. 2.—Anterior end from below.
Fig. 3.—Tenth foot.
Fig. 4.—Middle foot.

The head and the dorsal surface of the anterior region are widely covered with chestnut-brown markings, and there is a broad median dorsal stripe darker than the rest and with light edges. The feet and ventral surface are cream-coloured. The head (fig. 1) is broader than long and carries a pair of massive palpophores and two pairs of eyes. The tentacular cirri are short, the longest reaching back to the third chætiger. The proboscis (fig. 2) carries a pair of strong toothed pincers and the arrangement of the paragnaths is as follows :—i., 2 in a row ; ii., an oval patch of 3 rows ; iii., 1 ; iv., a small patch of two rows ; v. 1 ; vi. a circular patch of c. 9 paragnaths ; vii. and viii., a continuous sparse band of 3 to 4 rows.

Fig. 5.



Nereis oxypoda Marenzeller. Posterior foot.

At the fifteenth to sixteenth chætiger an oval lamella, resembling the dorsal cirrus of a Phyllodocid, appears above the dorsal cirrus, and increases in size from before backwards. I take this to be a gill. At the tenth foot (fig. 3) there is a dorsal cirrus about as long as the triangular upper dorsal languet. The anterior lip of the dorsal chæta-sac is prolonged to form a conical middle dorsal languet, and there is a lower dorsal languet similar to the middle. In the ventral ramus both the front and the hinder lips of the ventral chæta-sac are prolonged to form a pair of triangular languets smaller than the rest, and there is a prominent ventral languet. The ventral cirrus reaches about halfway down the ventral languet. In the middle region (fig. 4) the branchial lamella forms a large oval process, the upper dorsal languet is large, foliaceous and triangular, and the other languets are more slender and pointed. In the hinder region (fig. 5) the branchial lamella and the foliaceous upper dorsal languet are fused for part of their length, and together form a very large process, ending in two divergent branches between which the dorsal cirrus lies. Otherwise the feet show little change.

The bristles are homogomph spinigers throughout; no falcigers are present, but in the positions the latter normally occupy in the Nereid foot the spinigers are relatively short.

The body ends in a terminal anus with a pair of long pygidial cirri.

Remarks.—This species is related to *Nereis verrillii* Grube from (?) the Philippines. The arrangement of the paragnaths is similar except that they are more numerous in groups I. and V. of Grube's species; they both have foliaceous upper dorsal languets and both lack falcigers.

The branchial lamella is absent from *N. verrillii*. Marenzeller's species does not undergo an epitocous change. Its distribution is Japan, China, and now Western Australia.

Genus CERATONEREIS Kinberg.

Ceratonereis erythrææensis Fauvel. (Fig. 6.)

Fauvel, 1919, p. 407, pl. xvi. figs. 26–30 & 42–47.
? *Nereis* (*Ceratonereis*) *æquisetis* Augener, 1913, p. 171, pl. iii. figs. 48-49, text-figs. 18, *a–c*.

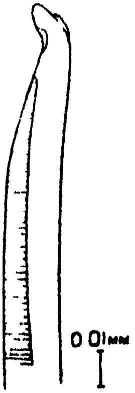
Occurrence.—Pelican, Swan River, Western Australia (9).

Remarks.—The largest of these specimens measures 45 by 2 mm. without the feet for 87 chætigers. They are unquestionably of Fauvel's species; the only difference that I can find is that the giant simple hook (fig. 6) is faintly bidentate instead of plain.

The difficulty arises that Augener's *æquisetis*, having the Swan River as its type-locality, differs from Fauvel's species only in the bristles. According to Augener falcigers are present only in the hinder fourth or fifth of the body and are all in the lower ventral ramus, *i. e.*, below the ventral aciculum. Augener makes no mention of the giant simple hook.

One must suppose either that at Swan River there are two very closely related species—*C. erythræensis* and *C. æquisetis*—living more or less side by side, or that Augener overlooked both the falcigers in the anterior region and the simple giant hook. In the latter case Fauvel's *erythræensis* becomes a synonym of Augener's *æquisetis*. The matter can only be decided by reference to Augener's types. Fauvel's species is known from the Red Sea, Djibouti, Madagascar, and China.

Fig. 6.



Ceratonereis erythræensis Fauvel. Giant simple hook.

Genus Leonnates Kinberg.

Leonnates ehlersi Augener. (Figs. 7–13.)

Nereis (*Leonnates*) *ehlersi* Augener, 1913, p. 142, pl. iii. fig. 53, and text-figs. 12 *a–c*.

Occurrence.—Crawley Bay, Swan River, Western Australia (3); Crawley Jetty, Swan River, Western Australia, found swimming at surface (1).

Description.—One of the specimens from Crawley Bay is complete and measures 98 mm. by 4 mm. without the feet for 122 chætigers. The colour of the Crawley Bay specimens is grey, with four lines of brown dorsal markings extending over the first few chætigers, two paramedian and two dorso-lateral. The pelagic specimen from Crawley Jetty has similar markings, but the colour of the body is pale brown instead of grey.

Fig. 7.

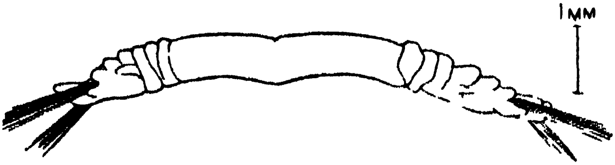


Fig. 8.

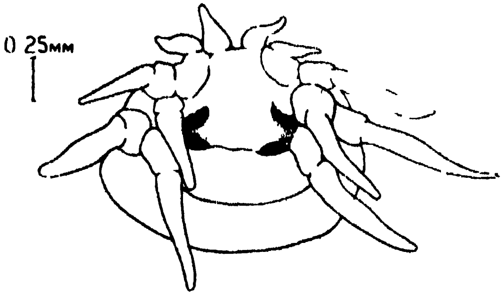
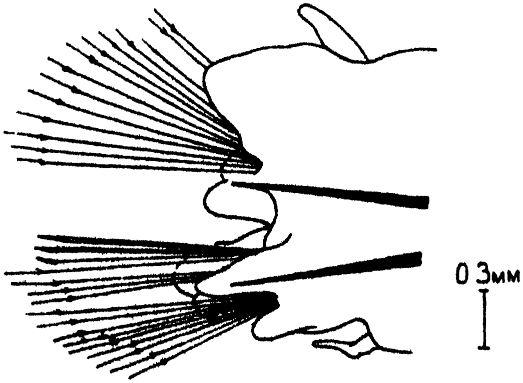


Fig. 9.



Leonnates ehlersi Augener.

Fig. 7.—Ventral view of tenth chætiger.
Fig. 8.—Head from above
Fig. 9.—Tenth foot.

The body is deeply grooved ventrally and there is a thin, pale, median dorsal streak. The parapodia are very long, the distance between the point where the foot merges into the body and the end of the ventral chæta-sac being about equal to the width of the body. In the anterior region the ventral surface of the parapodia forms about half a dozen folds, having the appearance of a row of tubercles (fig. 7). In the middle and hinder regions the skin of the ventral surface of the feet is loose and flaccid.

The head (fig. 8) is square in outline and has a slight median groove. The palpophores are fused with the head and the palps are very small, having about one-fourth the length of the head.

There are two pairs of eyes. The tentacles have about the same length as the palps. Of the tentacular cirri the dorsal member of the hinder pair reaches back to the third chætiger. The ventral member of the anterior pair has only about half this length. The rest are intermediate. Dorsally the buccal segment is extremely short, being about equal to the first chætiger. Ventrally it has twice this length. The proboscis carries a pair of delicate pincers, finely serrated rather than denticulate, but no true paragnaths. The aboral ring is densely papillated. The papillæ appear to be soft and not horny. I can find no papillæ of any kind on the oral ring. The proboscis is retracted in all the specimens, and my observations are based on dissections.

As regards the parapodia, in the anterior region there is a small dorsal cirrus set far back above a massive triangular upper dorsal languet, and there is a blunt middle dorsal languet a little shorter than the equally blunt lower dorsal languet (fig. 9). The ventral chæta-sac has a long bilobed anterior lip and a shorter simple posterior lip. There is a short, conical, ventral languet and a very small ventral cirrus set far back on the foot. In the middle region (fig. 10) the upper and lower dorsal languets are longer and more pointed and the middle dorsal languet almost disappears. The ventral languet is reduced to a small papilla. In the hinder region (fig. 11) the upper and lower dorsal languets are fused with the dorsal chæta-sac and form a single long, narrow structure with a bilobed tip. The upper dorsal languet acquires a row of dark glands, and above the dorsal cirrus there is a small conical process, the homology of which is not clear to me. In the ventral ramus the ventral languet is again prominent, and forms a long, digitiform process. The ventral cirrus is papilliform.

In the front and middle regions the bristles are dense and numerous, but they are much reduced posteriorly. In the front region all the dorsal bristles are homogomph

Fig. 10.

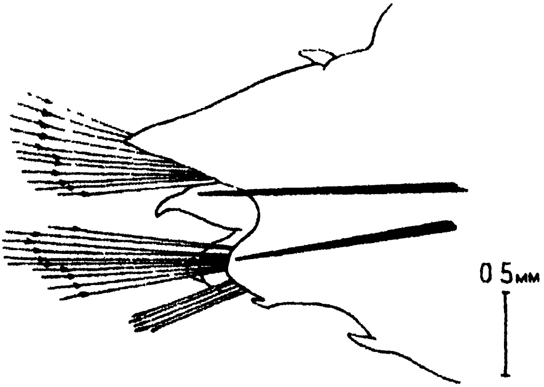
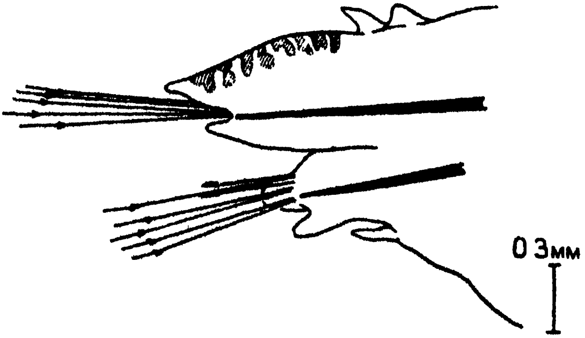


Fig. 11.



Leonnates ehlersi Augener.
Fig. 10.—Middle foot.
Fig. 11.—Posterior foot.

spinigers with long toothed blades. The upper ventral bristles are homogomph spinigers and homogomph falcigers (fig. 12), with rather short bidentate blades. The lower ventral bristles are all homogomph spinigers, no falcigers being present. In the middle region the only change in the bristles is the replacement by homogomph falcigers of the spinigers in the lower ventral ramus. In the hinder region, where the bristles are much less numerous, the falcigers are heterogomph (fig. 13) or hemigomph.

The body ends in a terminal anus with a pair of long pygidial cirri.

Remarks.—I have redescribed this very curious Nereid at some length because my observations do not agree in several particulars with those of Augener. According to Augener the oral ring of the proboscis is papillated. I find the aboral ring papillated. Augener finds no falcigers above the aciculum in the ventral ramus. In my specimens in the anterior region all the falcigers are above the aciculum, and there are only spinigers below it. Moreover, in the middle and hinder regions, where the lower ventral ramus contains falcigers only, there still persists a bundle of falcigers in the upper ventral ramus. Again, Augener describes them as all heterogomph. I find them homogomph except in the hinder region.

Fig. 12.

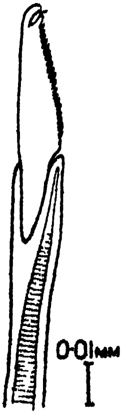
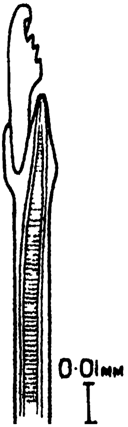


Fig. 13.



Leonnates ehlersi Augener.

Fig. 12.—Homogomph falciger.
Fig. 13.—Heterogomph falciger.

Augener attributes this species to *Leonnates*, but, as neither he nor I found any horny paragnaths, it should in my opinion go to *Leptonereis*. Augener's specimens were also taken at Swan River, and I have little doubt that his specimens and mine are conspecific.

The pelagic form appears to be a male, but although it has a different colour from the rest and the body-wall is thinner, it shows no obvious signs of sexual maturity.

Family **Eunicidæ.**

Genus MARPHYSA Quatrefages.

Marphysa sanguinea (Montagu) ?.

Fauvel, 1923, p. 408, fig. 161, *a–h*; and 1919, p. 381.

Occurrence.—Swan River, Western Australia (2).

Remarks.—There are two rather large specimens, showing a width of body of about 6 mm. without the foot, each broken into several pieces. The prostomium is divided, the gills begin at the 41st and 44th chætigers respectively, reach a maximum of about five filaments, and are continued to the end of the body. The dorsal bristles are all flattened simple capillaries throughout, and the ventral are all compound with knife-like blades. The subacicular bristle has a simple, undivided tip. *No comb bristles are to be seen.* The specimens are in fairly good condition, and it is highly improbable that they have simply been broken off, but the material does not in my view justify the designation of a specific or varietal difference. Fauvel insists that the tropical *Marphysa furcellata* Crossland is identical with Montagu's *M. sanguinea.* In the light of the variability of certain characters, *e. g.*, the acicula, in *M. sanguinea* he is probably right, but it should be borne in mind that in Crossland's species the subacicular hook has a simple curved tip and in the European form the subacicular hook is normally bidentate. In Fauvel's view *M. sanguinea* has an almost cosmopolitan distribution. Augener records an *M. furcellata* from Rottnest Island, S.W. Australia.

Family **Ariciidæ.**

Genus HAPLOSCOLOPLOS Monro.

Haploscoloplos kerguelensis (McIntosh).

Monro, 1936, p. 160.
Scoloplos kerguelensis Fauvel, 1932, p. 165.

Occurrence.—Swan River, W. Australia (5).

Remarks.—These specimens have the gill beginning at the fifteenth chætiger and only capillary chætæ in the feet.

Family **Sabellidæ.**

Genus Demonax Kinberg (char. emend. Johansson).

Demonax leucaspis Kinberg.

Monro, 1933, p. 1075, with citations.

Occurrence.—Crawley Bay Channel, Swan River, Western Australia, 20 ft. (1).

Remarks.—This species is known from Japan and Honolulu, but I believe this to be the first record from Australia.

Family **Serpulidæ.**

Genus Mercierella Fauvel.

Mercierella enigmatica Fauvel.

Fauvel, 1927, p. 360, fig. 123, *a–o*; and 1932, p. 249.

Occurrence.—Pelican, Swan River, W. Australia (a small cluster).

Remarks.—Since it was first described in 1923 from a canal in Normandy the range of this species has been enormously extended. It is now known from India, Egypt, North and South America, but I believe this to be the first record from Australia.

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LXIX.—*On Eighteen new Lithobiomorphous Chilopods.*

By RALPH V. CHAMBERLIN, University of Utah, U.S.A.

THE types of the new species described in this paper are at present in the author's collection at the University of Utah.

Family **Henicopidæ.**

Zygethobius ecologus, sp. n.

Yellowish-brown to chestnut when in full colour, typically darker in a stripe along mid-dorsal line; legs somewhat lighter than dorsum, but the antennæ about the same.

Antennæ of moderate length, composed of 28 to 34 articles, of which most are short, longer in distal portion as usual; the ultimate article rather short.

Prosternal teeth 3+3, the second tooth on each side closer to the mesal than to the ectal tooth of the series.

Posterior angles of sixth, seventh, ninth, eleventh, and thirteenth dorsal plates produced, the processes of sixth band seventh plates broader and less acute.

Coxal pores on last five pairs of coxæ as usual, few in number, circular, concealed in ventral view by the projecting ventral rim of the longitudinal depression or furrow.

Tibial process present on the first fourteen pairs of legs.

Claw of female gonopods large, strictly entire, acute; basal spines 2+2, stout, conical.

Length 10–11 mm.

Locality.—Oregon: Boyer. Four females taken in June and July, 1937 (*J. A. Macnab*).

Distinguished from species previously known in the angulation of the dorsal plates and in such points as the smaller number of antennal articles.

Lamyctes caducens, sp. n.

Resembling *L. pius* Chamberlin in proportions of anal legs, but the prosternal teeth 2+2 instead of 3+3, and the articles of the antennæ 26 instead of 28 or 29. The gonopods of the female with the claw rather short; the basal spines short and stout, apically flattened and acute, lost on one side. The dorsum is light brown, the head darker brown, while the antennæ, prehensors and legs are abruptly lighter, yellow.

Length 9 mm.

Locality.—New Mexico: Camp Mary White, Bear Canyon. One female taken in August, 1934, by S. Mulaik.

Family **Watobiidæ.**

ARKANSOBIUS, gen. nov.

Differing from genera of the Lithobiidæ, sens. str., in having spiracles on the eighth leg-bearing segment, these being present in addition on the third, fifth, tenth, twelfth, and fourteenth leg-bearing segments. It differs from *Watobius* in having a ventral spine at distal end of tibia, in addition to the one on anterior side, on all but the more posterior legs, true spines being elsewhere absent from legs. Eyes consisting of a patch of few ocelli on each side. Antennæ composed of 19 articles No complete ventral band to prehensorial segment; prosternal teeth 2+2.

Gonopods of male uniarticulate. Gonopods of female with claw entire; basal spines 2 | 2.

Genotype. *Arkansobius lamprus*, sp. n.

Arkansobius lamprus, sp. n.

General colour yellow, with head and antennæ and prehensors more orange.

Antennæ short, composed constantly of 19 articles, of which all between the third and ultimate are very short. Ocelli mostly 6 in number in 2 series, thus, 4, 2; the second ocellus of first series usually largest and the others decreasing anteriorly, the first not set off or enlarged; other arrangements 3, 2, and 4, 3.

Prosternal teeth acute and equal, pale, the median incision narrow and acute.

Coxal pores small, circular, mostly 2, 2, 2, 2.

Anal coxæ all unarmed. The two tibial spines typically well developed on legs of middle region, but absent from first and last several pairs. Prefemur of anal and penult legs with a transverse series of several stout setæ and spines at distal end above.

Claw of female gonopods strictly entire, rather long and acute. Basal spines 2+2, acute. Gonopods of male short, truncate.

Anal legs of both male and female crassate, but more strongly so in the male, the inflation most marked in femur and tibia.

Length 7–8 mm.

Locality.—Arkansas: Pike Co., April 7, 1937. Sixteen specimens, male and female.

Family **Lithobiidæ.**

Lithobius ethochætus, sp. n.

Dorsum reddish brown or chestnut, darker over anterior and posterior ends, antennæ and posterior legs of similar colour, but the others lighter.

Antennæ short and attenuated joints short, tips broken off; articles above 24 in number Single ocellus proportionately very large, subvertical and subelliptic The ordinary ocelli small, decreasing anteriorly, regularly arranged in 4 series, about 18 in number.

The special prosternal spine, which is slender but obviously stouter than the setæ, is located caudad of the interval between the two outer teeth on each side. One tooth ectad of this diastema, the complete formula being 1+4+4+1.

Posterior angles of ninth, eleventh, and thirteenth dorsal plates produced.

Coxal pores in a single series, transversely subelliptic or in part circular, in number typically 9, 8, 8, 7.

Gonopods of female with claw tripartite, the median lobe much longest; basal spines 2+2, stout, subcylindrical except at abruptly conical tip.

Anal legs with two claws; ventral spines 0, 1, 3, 3, 1; dorsal spines 1, 0, 3, 1, 1, Penult legs also with two claws; ventral spines 0, 1, 3, 3, 2; dorsal 1, 0, 3, 1, 1. Dorsal spines of thirteenth legs 1, 0, 3, 2, 2; ventral, 0, 0, 3, 3, 2. Ventral spines of anterior pairs of legs 0, 0, 2, 3, 2. Last four pairs of coxæ dorsally armed, last three also armed laterally.

Length 23 mm.

Locality.—Taken at quarantine at New Orleans in cargo from Panama, August 10, 1936. One female.

Runs to *L. chumasanus* Chamberlin in the author's key, and is much like that species in most points. It seems to differ, however, in the spine-like character of the special prosternal setæ, and in having the claw of the female gonopod distinctly tripartite. No specimens of *chumasanus* are at hand for re-examination as to the presence of the prosternal diastema.

Australobius (*Malayobius*, subgen. n.) *vians*, sp. n.

Colour fulvous, faded in preservative.

Antennæ and their constituent articles of moderate length; articles 20, of which the ultimate is longer than the two preceding. Eyes composed of about 10 ocelli arranged thus: 1+4, 3, 2; the single ocellus but slightly enlarged, the ocelli of the bottom row small.

Prosternal teeth 6+5, the special seta caudoectad of outermost tooth on each side.

None of the dorsal plates produced.

Coxal pores small, circular, few in number.

Last two coxæ laterally armed as well as dorsally, Spines of anal legs 0, 1, 3, 2, 0; dorsal, 1, 0, 3, 1, 0: the claw single Ventral spines of penult legs 0, 1. 3, 3, 1; dorsal, 1, 0, 3, 1, 0 (1 ?).

Ventral spines of first legs, 2, 2, 1.

Length, cir. 8 mm.

Locality.—From Malay States, taken at Hawaii May 8, 1931. One female, possibly lacking one moult of maturity.

Placed in a separate subgenus on the basis of the lack of angulation in any of the dorsal plates. A male of a second species of this group and "from the Orient" was taken at Honolulu, April 27, 1932, but is not here described.

BANOBIUS, gen. nov.

None of the dorsal plates produced, or angles of the thirteenth slightly so.

Antenna and its articles long; number of articles uncertain as ends are gone from antennæ of genotype.

Prosternal teeth in genotype 3+3.

Ocelli seriate, in about four series, the single ocellus set off from others.

Coxal pores uniseriate.

Distinguished especially by having tibia of both anal and penult legs in the male bearing at distal end above a rounded eminence bearing numerous special setæ.

Genotype. *Banobius tener*, sp. n.

Banobius tener, sp. n.

The genotype is a freshly moulted male in which the colour at present is pale yellowish brown with some violaceous pigmentation.

Antennæ with all articles long, only 17 present on each side of type, the tips being broken off. Eyes on lateral margin of head close to antennæ; ocelli in four series, about as follows: 1+1, 2, 4, 3; single ocellus large and well separated.

Prosternal teeth in genotype 3+3, small. Special seta ectal in position, hair-like.

Coxal pores small and circular, uniseriate.

Anal coxæ armed dorsally and laterally. Anal legs with dorsal spines 1, 0, 3, 1, 0; ventral, 0, 1, 3, 3, 1; with one accessory claw. Dorsal spines of penult legs 1, 0, 3, 1, 1; ventral, 0, 1, 3, 3, 2; with one accessory claw.

Anal and penult legs in the male thickened, with fourth joint especially swollen; tibia in both pairs bearing a low, rounded eminence at distal end on dorsal surface at distal end of a furrow, this eminence bearing a dense patch of moderately short setæ.

Length about 12 mm.

Locality.—Oregon: Boyer. One male taken in an old stump May 13, 1933 (*J. A. Macnab*).

Genus SIGIBIUS Chamberlin.

Sigibius Chamberlin, 1913, Bull. Mus. Comp. Zool. vol. lvii. no. 2, p. 101.

Haplolithobius Verhoeff, 1925, Arch. f. Naturg. vol. xci. A, Heft. 9, p. 156.

Key to known Species.

- ***a*. Claw of anal legs single.**
  - ***b*. None of legs with spines** .... *S. exarmatus* (Br.)
  - ***bb*. Legs with spines** .... *S. fosteri* (Brade-Birks).
- ***aa*. Claw of anal legs double.**
  - ***b*. None of legs spine** .... *S. olivarum* (Verhoeff).
  - ***bb*. At least some of legs spined** ....
    - ***c*. Ventral spines of anal legs 0, 1, 3, 1, 0** .. *S. enans*, sp. n.
    - ***cc*. Ventral spines of anal legs 0, 1, 1, 1, 0.**
      - ***d*. Dorsal spines of anal legs 0, 0, 2, 0, 0; of penult, 0, 0, 2, 1, 0** .... *S. nidicolens*, sp. n.
      - ***dd*. Anal and penult legs with third joint bearing a single dorsal spine.**
        - ***e*. Dorsal spines on thirteenth legs 0, 0, 1, 0, 0; ocelli usually in two series; N. American** .... *S. puritanus* Ch.
        - ***ee*. No dorsal spine on thirteenth legs; ocelli always in one series; European** .... *S. duboscqui* (Brol.).

Sigibius enans, sp. n.

Of usual colour and proportions.

Articles of antennæ 26. Ocelli 1+2, 3.

Ventral spines of anal legs 0, 1, 3, 1, 0, accessory claw on inner side, small; dorsal 0, 0, 2, 0, 0. Dorsal spines of penult legs 0, 1, 3, 3, 0, claws 2, one with indication of an abortive third one. Ventral spines of first legs 0, 0, 0, 1, 1; of the second, 0, 0, 0, 2, 1.

Length 7·2 mm.

Locality.—Presumably Honduras, being taken at quarantine at Baltimore, May 25, 1936.

Readily distinguished by the different spining of the legs from previously-known species.

Sigibius nidicolens, sp. n.

Ocelli 1+3, 2. Articles of antennæ 25.

Coxal pores 2, 2, 2 (3), 2.

Ventral spines of anal legs 0, 1, 1, 1, 0, claws 2 as usual; dorsal spines 0, 0, 2, 0, 0. Dorsal spines of penult legs 0, 0, 2, 1, 0; ventral, 0, 1, 1, 1, 0. Ventral spines of thirteenth legs 0, 0, 0, 1, 1; dorsal 0, 0, 2, 1, 1. Ventral spines of first and second legs 0, 0, 0, 0, 0.

Length 5·2 mm.

Locality.—Virginia: Harrisburg. A female (holotype) and male (allotype) taken in nest of Carolina Junco, September 22, 1937.

Distinct in small size, small number of coxal pores, and especially the spining of the legs.

Oabius (*Zanobius*) *aiolus*, sp. n.

General colour yellow, the head and antennæ and the posterior tergites usually darker than other parts, the antennæ lighter at tips.

Antennæ short and conspicuously attenuated as usual. Single ocellus not enlarged; the ordinary ocelli typically in three series, few in number, *e. g.*, 1+2, 3, 2. Prosternal teeth small, pale, evenly spaced.

Coxal pores small and round as usual, mostly 2, 3, 3, 3.

Gonopods and basal spines of females typical.

Tarsi of all but posterior legs undivided. Anal legs with claws single, the ventral spines mostly 1, 3, 3, 0, but sometimes 1, 3, 2, 0; dorsal spines 1, 0, 3, 1, 0. Dorsal spines of penult legs 1, 0, 2, 1, 1; ventral, 0, 1, 3, 3, 2;

with one accessory claw. Dorsal spines of thirteenth legs 1, 0, 2, 1, 1. Ventral spines of first legs usually 0, 0, 1, 2, 1; of the second, 0, 0, 1, 3, 1. Third joint of about ninth pairs unarmed ventrally, but dorsally armed with a single spine. Only the anal coxæ laterally armed.

Tibia of anal legs of male at distal end with a dorsal keel or process, similar to that present in males of *Nadabius* and *Garibius.*

Length 10 mm.

Locality.—Oregon: Boyer, July, 1937. Many specimens (*J. A. Macnab.*)

Placed in a new subgenus primarily on the basis of the modification of the tibia of the anal legs of the male, unknown in other species.

Oabius mimosus, sp. n

Two lots of *Oabius* collected in rotten wood in August, 1933, seem to specifically differ from those collected in 1937, and are here designated under the name above. While similar in colour, or but little darker and more orange at ends, and size and general structure, they differ in having the ventral spines of the anal legs constantly 0, 1, 3, 2, 0, and in not having the tibia of the anal legs of the male elevated at the distal end, its dorsal line running on about the same level as that of the first tarsus. The third joint of all legs.

Length 9 mm.

Locality.—Oregon: Boyer. Nine specimens taken on August 10 and 13, 1933, in rotten wood, by "C. J. J.," and received from J. A. Macnab. All but one are males.

Oabius parvior, sp. n.

Dorsum and antennæ brown, the legs yellow; posterior pairs somewhat darker.

Antennæ short, composed of 20 articles. Ocelli in two series, *e. g.*, 1+4, 3; the single ocellus not separated and not especially enlarged.

Prosternal teeth 2+2.

Coxal pores small, few.

Tarsi of all but posterior legs strictly entire. Anal coxæ armed laterally and dorsally, the penult dorsally. Ventral spines of anal legs 0, 1, 3, 2, 0; dorsal 1, 0, 3, 1, 0;

claw single. Ventral spines of anal legs 0, 1, 3, 3, 3; dorsal, 1, 0, 3, 1, 1; claws 3. Ventral spines of first legs 0, 0, 0, 0, 1.

Anal legs of male simply and moderately inflated.

Length, cir. 5·5 mm.

Locality.—New Mexico: Bear Canyon, Camp Mary White. One male taken in August, 1934.

Pokabius (*Lophobius*) *stenenus*, sp. n.

Dorsum yellow-brown, lighter posteriorly and with the head light chestnut Legs yellow.

Ocelli 1+4, 3, 3.

Antennæ short, composed of 20 articles of the usual proportions.

Prosternal teeth in the male holotype 3+3, with the tooth at inner end of right series vestigial.

Posterior angles of none of the dorsal plates produced.

Coxal pores small, circular, 2, 3, 3, 2.

Ventral spines of first pair of legs 2, 3, 2. Ventral spines of penult legs 0, 1, 3, 3, 2; dorsal 1, 0, 3, 1, 1. Ventral spines of anal legs 0, 1, 3, 2, 0; dorsal 1, 0, 3, 1, 0. Anal coxæ laterally armed, the coxæ of last four pairs dorsally armed.

Anal legs of male with fourth joint swollen, bowed ventrad, the ventral line in side view appearing convex, the dorsal concave; dorsal surface with a shallow longitudinal furrow and bearing at distal end a conspicuous keel-like ridge or process, which decreases in height from its caudal end cephalad, its anterior end reaching level of bottom of femur distad of middle of joint.

Length 16 mm.

Locality.—Oregon: Grant's Pass, June 12, 1937.

Pokabius præfectus, sp. n.

This species seems to be very close to *P. centurio*, and presents modifications of the anal and penult legs of the male that are nearly identical. However, the dorsal process at the distal end of the fourth joint of the penult leg differs in not being narrow in transverse direction, but nearly as broad as joint and deeply pitted or furrowed above. In addition, the species differs in having the eleventh and thirteenth tergites with the posterior angles only moderately produced, and those of the ninth not at all truly produced. *P. nankus* Chamberlin has angles of none of the dorsal plates produced.

Length about 13 mm.

Locality.—New Mexico : Camp Mary White, Bear Canyon, 15 miles south-east of Cloudcroft at 8000 ft. elevation. A male and female taken August 20, 1934, by S. Mulaik.

Pokabius hopianus, sp. n.

Dorsum yellow-brown, the head, antennæ and prehensors orange.

Ocelli 1+3, 3, the single ocellus not separated and scarcely larger.

Antennæ short, composed of 25 articles.

Prosternal teeth very small, pale, 2+2.

Coxal pores very small, few in number.

None of the dorsal plates with angles produced.

Last two pairs of coxæ laterally armed. Ventral spines of anal legs 0, 1, 3, 2, 0, the claw single ; dorsal spines, 1, 0, 3, 1, 0. Ventral spines of penult legs, 0, 1, 3, 1, 1 ; dorsal, 1, 0, 3, 1, 1. Ventral spines of first legs 0, 0, 1, 2 (3), 1.

Anal legs of the male strongly modified, much as in *P. centurio* ; the fourth joint correspondingly thickened, with a deep longitudinal excavation caudad of the proximal elevation ; the third joint conspicuously elevated at the distal end, the process subconically pointed and exceeding the adjacent process of the fourth article, preceded by a furrow that is limited by a setigerous ridge along its ectal side ; tibia and first tarsal article moderately crassate.

Length 10·5 mm.

Locality.—Arizona : Wickensburg. One male taken by R. V. Chamberlin, April 7, 1938.

Sozibius texanus, sp. n.

Colour pale yellow throughout.

Antennæ of moderate length, composed of 28 articles.

Ocelli 1+4, 4 (3), 2, the single ocellus but little enlarged.

Prosternal teeth 4+4, small, uniform ; special spine bristle-like, ectal in position.

Posterior angles of ninth tergite slightly produced, those of eleventh and thirteenth plates somewhat more produced, but the process still short.

Coxal pores small, circular, 2, 2, 2, 2.

None of the coxæ laterally armed. Anal legs with claw single; ventral spines 0, 1, 3, 1, 1; dorsal spines 1, 0, 3, 1, 0. Claw of penult legs also single; ventral spines 0, 1, 3, 1, 1; dorsal 1, 0, 3, 1, 1 Ventral spines of first and second legs 0, 0, 1, 1, 1.

Length 9·5 mm.

Locality.—Texas: Bexar Co. One male taken March 22, 1937.

Family **Gosibiidæ**.

Labrobius investigans, sp. n.

Dorsum light brown, head and antennæ darker, legs yellow.

Ocelli 1+3, 3, 3 (2), the single ocellus enlarged and well separated; the first ocellus of top series also enlarged, but the others very small.

Antennæ long, distally slender, in holotype consisting of 51 articles.

Prosternal teeth 3 + 3, small, well-spaced, the median incision U-shaped.

Posterior angles of ninth, eleventh, and thirteenth dorsal plates produced, but those of ninth not strongly so.

Coxal pores small and circular: 4, 4, 4, 4.

Last three pairs of coxæ laterally armed, only the last pair dorsally armed. Anal legs missing from type. Dorsal spines of penult legs 0, 0, 3, 2, 2; ventral, 0, 1, 3, 3, 2; claws 3. Ventral spines of first legs, 0, 0, 0, 1, 1.

Claw of female gonopods entire; basal spines 2+2.

Length 15 mm.

Locality.—Mexico: Hidalgo. Taken at quarantine in San Francisco, November 23, 1936. One female.

Gosibius mulaiki, sp. n.

Dorsum in general brown, with head, antennæ, prehensors and posterior legs orange, the other legs yellow.

Ocelli in a compact group, small, the single eye scarcely removed; a typical arrangement 1+2, 3, 4, 3, 2. Antennæ rather long, the articles mostly long and rather loose, typically 31 in number.

Prosternal teeth 2 + 2, small, the ectal spine short and slender, inserted on anterior margin ectad of outer tooth on each side.

Posterior angles of none of the dorsal plates produced.

Coxal pores round, rather small, typically 5, 6, 6, 5 (4).

Last three pairs of coxæ armed both dorsally and laterally. Ventral spines of anal legs 0, 1, 3, 3, 1 ; dorsal 1, 0, 3, 2 (1), 0 ; claw single Ventral spines of penult legs 0, 1, 3, 3, 2 ; dorsal, 1, 0, 3, 2, 2 ; claws 2. Ventral spines of first legs 0, 0, 2, 3, 2.

Gonopods of female with claw long, acute and strictly entire ; basal spines 2+2 ; basal article excavated as usual. Anal legs of male not obviously modified.

Length 16–22 mm.

Locality.—New Mexico : Camp Mary White, Bear Canyon, 15 miles south-east of Cloudcroft, August 20, 1934. Seven specimens taken by S. Mulaik.

Gosibius texicolens, sp. n.

Dorsum light brown, the head, prehensors, antennæ and posterior legs darker.

Antennæ moderately long, composed of 25 articles. Ocelli 1+3, 2, 1, the single ocellus large.

Prosternal teeth 2+2, the ectal spine hair-like ; the anterior margin not continued far ectad of outer tooth as it is in *mulaiki*.

Posterior angles of none of the dorsal plates produced.

Coxal pores small, round, 3, 3, 3, 2.

None of the coxæ armed either dorsally or laterally. Ventral spines of anal legs 0, 1, 3, 2, 1 ; dorsal, 0, 0, 3, 1, 0 ; claws, 2. Ventral spines of penult legs 0, 1, 3, 3, 2 ; dorsal 0, 0, 3, 2, 1 ; claws 2. Ventral spines of first legs, 0, 0, 1, 1, 1.

In the anal legs of the male the third article is clavately enlarged, the fourth conspicuously swollen and longitudinally furrowed above.

Length 12 mm.

Locality.—Texas : Edinburg. Male holotype taken by S. Mulaik, November 29, 1936 ; also male paratype, 1934.

BIBLIOGRAPHICAL NOTICE.

British Guiana Papers. Scientific Results of the Oxford University Expedition to British Guiana in 1929. Published for the Oxford University Exploration Club by the Oxford University Press ; London : Humphrey Milford, 1938. Price 21*s*.

THE aim of the Expedition was "not primarily to explore unknown territory, but to penetrate into the canopy of the tropical rain-forest, which offered the prospect of discovering a zone of life practically untouched by science," and the present volume contains a collection of thirty-one reprints of papers by different authors describing some of the results. An excellent introductory paper by the leader of the Expedition, Major R W. G. Kingston, is followed by an ecological description by T A. W. Davies and P W. Richards of the vegetation of Moraballi Creek, where the main work has been carried out. Twenty-one papers by N. Y. Sandwith, T. A. Sprague, J. Lanjouw, A. H. G. Alston, W. Trelease, T. Petch, E. M. Wakefield, and P. W. Richards contain descriptions of new plants and notes on the less known ones, as well as complete lists of some groups, based on collections brought back. E. M. and B. D. Nicholson contributed "An Ornithological Transect of the North Atlantic," which includes interesting notes on the birds observed during three crossings between London and the West Indies made at different seasons. Another paper of ornithological interest is by E. M. Nicholson, on the communal display in humming-birds. Entomological results are described in papers by H. Womersley (Apterygota), F. W. Edwards (Diptera Nematocera), M. E. Mosely (Trichoptera and Ephemeroptera), R. B. Benson (Sawflies), and O. W. Richards (Specidæ and Bembecidæ, including an extensive monograph of the American species of the genus *Tripoxylon*).

It would be probably not fair to judge from this first volume how far the Expedition succeeded in elucidating the problem set before it, but the few lists of insect groups that have been worked out contain practically no indication of the existence of a special tree-top fauna in a tropical forest. This fauna would be in any case almost impossible to distinguish, because its distinctness could be established only by detailed comparison with that of the lower strata, which itself remains practically unexplored. However, a second volume of the results, which is promised to appear later, may provide better data for generalisations, and the present volume certainly forms a welcome addition to the literature on the ecology of South American rain-forest.

INDEX TO VOL. II.

ACANTHONEURA, new species of, 407.
Acidoproctus, new species of, 196.
Acridiidæ from Sarawak, 217.
Alexander, C. P., on new or little-known Tipulidæ, 416.
Almodes, new species of, 516.
Amintinus, gen. et sp. n., 390–393.
Anamesacris, new species of, 602.
Andrena, new species of, 146.
Andrewes, H. E., on Oriental Carabidæ, 185.
Anthypna, new species of, 288–290.
Antichloris, new species of, 507.
Apalochrus, new species of, 301.
Aphænogaster, new species of, 500.
Apion, new species of, 395–398.
Arkansobius, gen. et sp. n., 626.
Aroa, new species of, 384, 385.
Arrow, G. J., on stag-beetles, 49; on the Coleopterous genus Anthypna, 285.
Australobius, new species of, 628.
Balanophyllia, new species of, 142.
Banobius, gen. et sp. n., 628, 629.
Barbus, new species of, 64, 85–88.
Barnard, K. H., on the species of Barbus from the Cape Province, 80.
Barrandeophyllum, new species of, 36.
Basantisia, gen. et sp. n., 199, 203.
Bees, descriptions and records of, 146.
—— from Palestine, 15.
Benson, R. B., on the Australian Orussidæ, 1; on sawflies of the subfamily Trichorhachinæ, 117; on sawflies of the family Tenthredinidæ, 236; on some new Australian sawflies, 358.
Bibliographical notices: 'General Biology' (P. D. Strausbaugh and B. R. Weimer), 239; 'The Mollusca of South Australia.—Part I. The Pelecypoda' (Bernard C. Cotton and Frank E. Godfrey), 310; 'A Guide to Veterinary Parasitology and Entomology for Veterinary Students and Practitioners' (T. Southwell and A. Kirshner), 560; 'British Guiana Papers: Scientific Results of the Oxford University Expedition to British Guiana in 1929,' 636.
Bostrychopsis, new species of, 388.
Bothrops, new species of, 447.
Brachiopods, Caradocian, from North Wales, 241.
Bristowe, W. S., on some new Termitophilous spiders from Brazil, 67.
Brontosauriella, gen. et sp. n., 71, 72.
Bruchus, new species of, 399, 400.
Bryant, G. E., on new species of Chrysomelidæ from Africa, 593.
Burgeon, L.: Nouveaux Apion du Congo Belge, 395.
Callisthenia, new species of, 505.
Cerapachys, new species of, 499.
Cercyonia, new species of, 598.

Chamberlin, J. C., on new and little-known false-scorpions from the Pacific and elsewhere, 259; on new Lithobiomorphous Chilopods, 625.
Chapman, W. M., and Townsend, L. D., on the osteology of Zaprora silenus Jordan, 89.
Cheilophleps, gen. et sp. n., 237, 238.
Cheiridium, new species of, 268, 270.
China, W. E., on Melichar's 'Monographie der Cicadellinen,' 182.
Chrysobothris, new species of, 475.
Cirphis, new species of, 509–512.
Clarissa, new species of, 360.
Cobanilla, new species of, 381.
Cockerell, T. D. A., descriptions and records of bees, 146.
Collenette, C. L., on new Lymantriidæ, 368.
Coloracris, gen. et spp. nn., 226–231.
Ctenomyophila, new species of, 42.
Ctenucha, new species of, 508.
Cucullia, new species of, 512.
Curculionidæ, new Brazilian, 42.
Dasychira, new species of, 382, 383.
Deretiodes, new species of, 347.
Doricorys, new species of, 605.
Doro, new species of, 541.
Diandrena, new species of, 148.
Dilophus, new species of, 325–330.
Dioxys, new species of, 148.
Dolichoderus, new species of, 502.
Donisthorpe, H., on new species of ants, 498.
Dorcus, new species of, 55–58.
Dysderina, new species of, 67, 69.
Ecpantheria, new species of, 504, 505.
Edwards, F. W., on Bibionidæ collected by Mr. F. Plaumann in Brazil, 321.
Eleutherodactylus, new species of, 440.
Euproctis, new species of, 371–380.
Eurys, new species of, 359, 360.
False-scorpions from the Pacific and elsewhere, 259.
Figulus, new species of, 59–61.
Fraser-Brunner, A., on a new fish of the genus Selenotoca, 76; on the classification of certain British fishes, 410.
Gamasomorpha, new species of, 69.
Gasterocercodes, new species of, 48.
Gibbons, S. G., on early development stages of Copepoda, 493.
Gosibius, new species of, 634, 635.
Guiglia, gen. et sp. n., 11–13.
Halictus, new species of, 149, 150.
Haplochernes, new species of, 275.
Helius, new species of, 433–436.
Hemerobius, new species of, 305.
Hinton, H. E., on the genera of the Cyphophthalmi, 331.
Hopkins, G. H. E., on Mallophaga, 191.
Horst, C. J. van der, on Balanophyllias from the Cape of Good Hope, 139.
Hyalurga, new species of, 508.
Hypothenemus, new species of, 453.
Illice, new species of, 506.
Ilyodrilus, new species of, 545.
Jamesonia, new species of, 596, 598.
Jones, R. F., and Washbourn, R., on the fresh waters of Palestine, 517.
Kimmins, D. E., on new species of Neuroptera, 305; on Hermes dubitatus and H. diversus, 354; on Nelees Navás, 1912, 366; on the Plecoptera of New Zealand, 561.
Labrobius, new species of, 634.
Laccophyllidæ from Bohemia, 18.
Lamprochernes, new species of, 279.
Lamyctes, new species of, 625.
Lesne, Pierre, on Abyssinian Coleoptera, 387.
Leucoma, new species of, 369.
Limonia, new species of, 416–427.
Lithobius, new species of, 627.
Lymantria, new species of, 381.
Lymire, new species of, 506.
Macdonald, J. D., on importance of colour-pattern in the phylogeny of certain barbets, 73.
Macrocentrus, new species of, 314, 317.
Macrocoma, new species of, 593.
Mallophaga, stray notes on, 191.
Marshall, Sir Guy A. K., on new Brazilian Curculionidæ, 42.
Mavromoustakis, G. A., on some Anthidiine bees from Palestine, 15; on new bees from Cyprus, 464.
Megaleptoperla, new species of, 568.
Meliboeus, new species of, 473.
Melyris, new species of, 301.
Meranoplus, new species of, 501.
Microphanurus, new species of, 126–135.
Mixis, new species of, 301.

Monro, C. C. A., on Polychæta from Uruguay, 311; on Polychæta from Swan River, Western Australia, 614.
Mosely, M. E., on a new Corsican Trichopteron, 204.
Moy-Thomas, J. A., on Lower Carboniferous fishes, 291; on the teeth of a new Elasmobranch from Dumfriesshire, 612.
Muir-Wood, Helen M., on British Eocene and Pliocene Terebratulas, 154.
Mydromera, new species of, 507.
Myopone, new species of, 498.
Neoeurys, new species of, 361–365.
Neogovea, gen. et sp. n., 333, 334.
Nesoperla, new species of, 570.
Nixon, G. E. J., on Asiatic species of Microphanurus, 122; on two new Oriental Macrocentrus, 314.
Nomada, new species of, 152.
Nothochrysa, new species of, 307.
Oabius, new species of, 630, 631.
Oakley, K. P., on some Ordovician Bryozoa from Akpatok Island, 206.
Œnothalia, new species of, 515.
Oonops, new species of, 70.
Orimarga, new species of, 429–431.
Orussidæ, Australian, 1.
Orussobaius, gen. et spp. nn., 8–10.
Osmia, new species of, 464–471.
Pachydictya, new species of, 214.
Pæctes, new species of, 513.
Pande, B. P., on a new genus of Pleurogenetinæ from a kingfisher, 199.
Pantana, new species of, 385.
Pararoncus, gen. et sp. n., 260, 261.
Parauthymia, new species of, 234.
Parker, H. W., on the Australian frog Hyla aurea Lesson, 302; on some reptiles and amphibians, 438.
Pellucens, new species of, 371.
Penichrolucanus, new species of, 61.
Perdita, new species of, 152.
Perkins, F. A., on Diptera from Sarawak, 401.
Phalaca, new species of, 233.
Philopotamus, new species of, 204.
Pic, M.: Helodidæ et malacodermes nouveaux, 300; Trois Bruchus L., nouveaux des Indes, 399
Plecia, new species of, 322.
Pokabius, new species of, 632, 633.
Polydora, new species of, 311.
Prantl, F., on some Laccophyllidæ from the Middle Devonian of Bohemia, 18.
Pseudaclytia, new species of, 507.
Pucialia, new species of, 514.
Redoa, new species of, 370.
Ressorella, new species of, 247.
Reuschella, new species of, 252.
Rhopalochernes, new species of, 271.
Sambus, new species of, 477.
Sampx, new species of, 255.
Schaus, W., on new species of American Heterocera, 504.
Schedl, Karl E., on African Scolytidæ and Platypodidæ, 450.
Scirtes, new species of, 300.
Scolytoplatypus, new species of, 157.
Selenotoca, new species of, 78.
Sigibius, new species of, 630.
Sozibius, new species of, 633.
Spanocerca, new species of, 575.
Spanocercoides, gen. et sp. n., 576, 577.
Spermologus, new species of, 43.
Sphingonotus, new species of, 600.
Spiders, Termitophilous, from Brazil, 67.
Stag-beetles, 49.
Stephensoniana, gen. nov., 539.
Storeus, new species of, 344
Syagrus, new species of, 595.
Syringaxon, new species of, 26–33.
Tachygonus, new species of, 46, 47.
Terebratula, new species of, 165.
Thamnurgus, new species of, 456.
Théry, A. Description d'un Melibœus de la faune paléarctique et de deux Buprestidæ exotiques, 473.
Thompson, G. B., on the Piaget collection of Mallophaga, 339; on the Mallophaga parasitic on Musophagidæ, 349; on Mallophaga from Phaëthon rubricauda roseotincta, 458; on the lice of petrels, 481; on the type-hosts of the Mallophaga, 580; on the Piaget Collection of Mallophaga, 607.
Tiphaura, new species of, 44.
Townsend, L. D., and Chapman, W. M., on the osteology of Zaprora silenus Jordan, 89.
Tragiostus, gen. et sp. n., 454.

Trewavas, Ethelwyn, on Barbus wöhlerti, sp. n., 63.
Turacœca, gen. et spp. nn., 350, 353.
Uvarov, B. P., on new and interesting Acrididæ from Mauretania, 599.
Washbourn, R., and Jones, R. F., on the fresh waters of Palestine, 517.
White, Errol I., on the generic name Æthalion, 319.
——, *see* Woodward, Sir Arthur Smith, 367.
Whittick, R. J., on a second specimen of Cryptocellus simonis, 479.
Whittington, H. B., on new Caradocian Brachiopods from North Wales, 241.
Willemse, C., on Acridiidæ from Sarawak, 217.
Woodward, Sir Arthur Smith, and White, Errol I., on the Upper Devonian shark, Cladoselache, 367.
Xamorpus, new species of, 300.
Xyloctonus, new species of, 452.
Zimmerman, Elwood C., on Storeus and Deretiodes, 343.
Zygothobius, new species of, 625.

END OF THE SECOND VOLUME.

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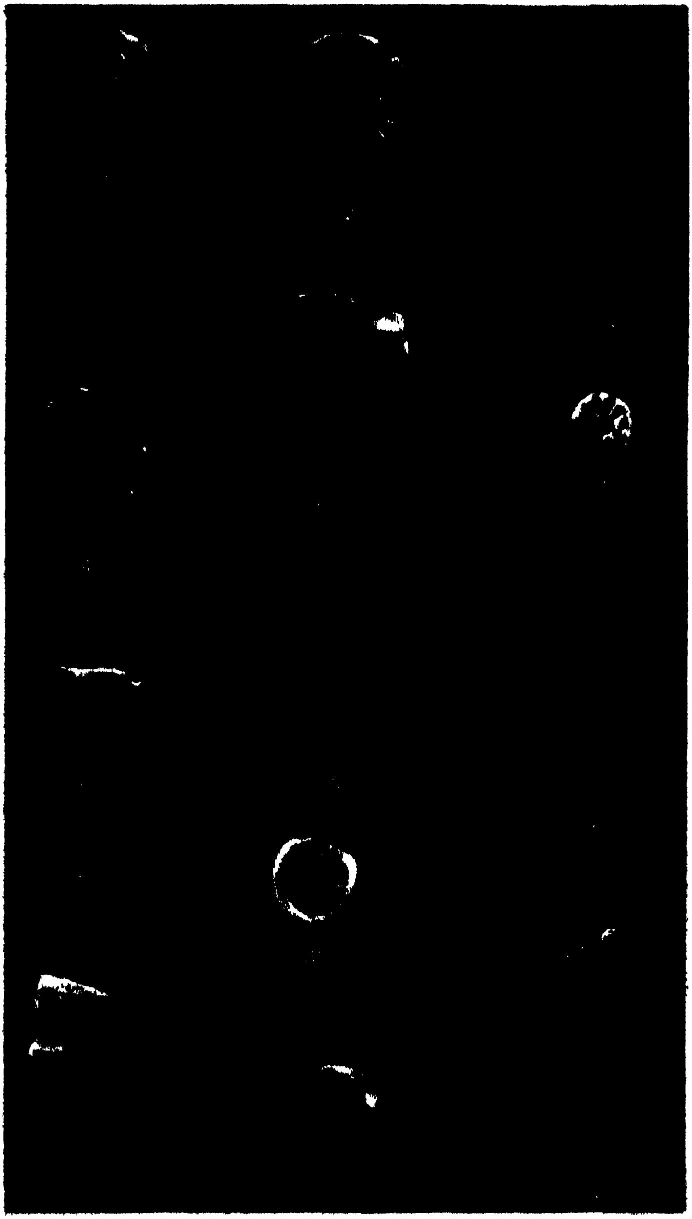

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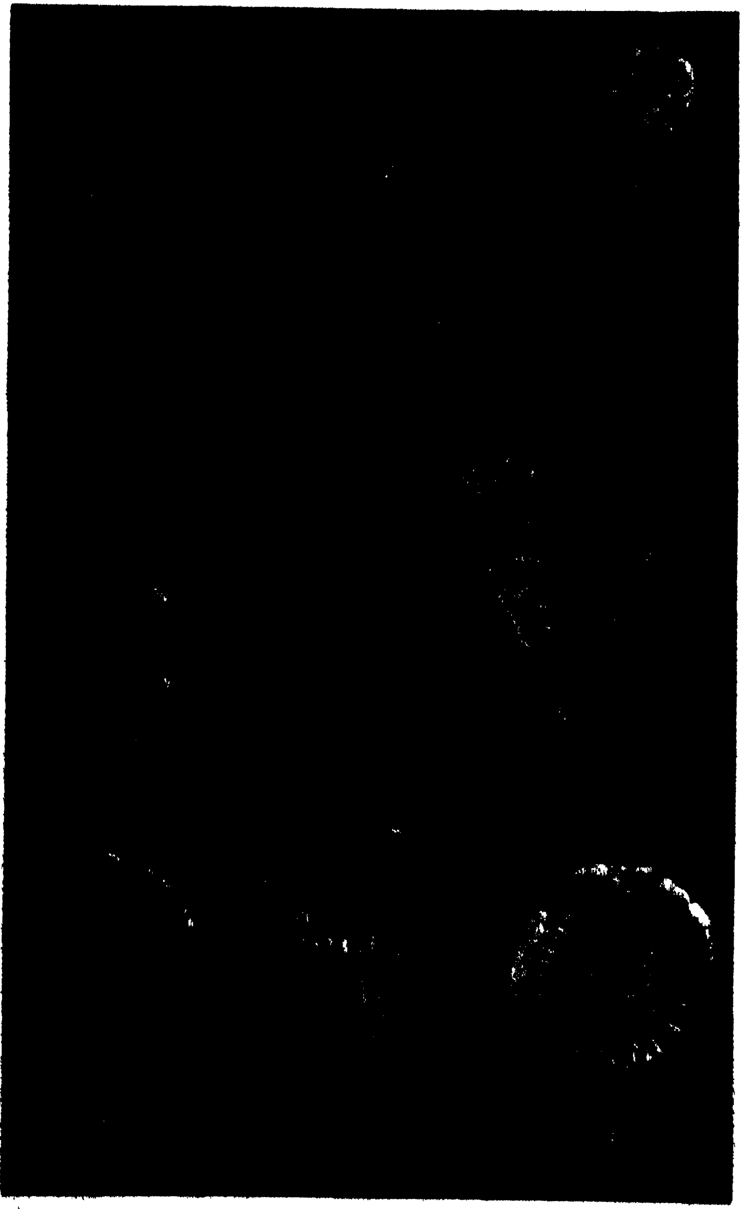

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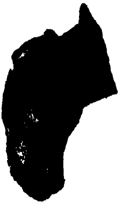

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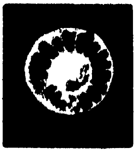

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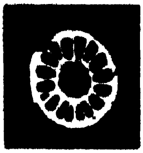

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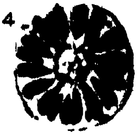

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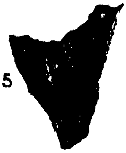

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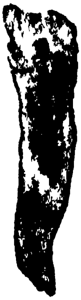

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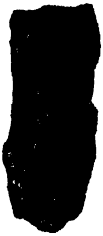

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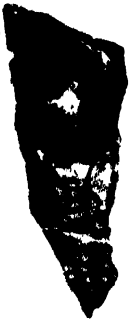

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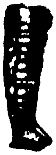

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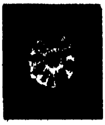

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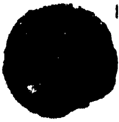

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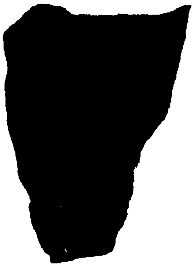

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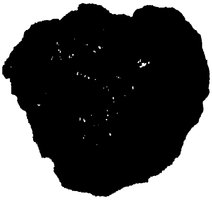

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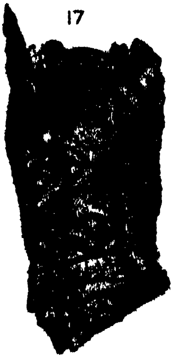

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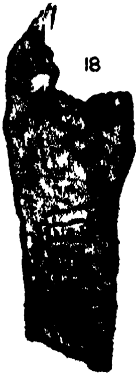

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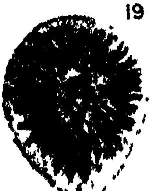

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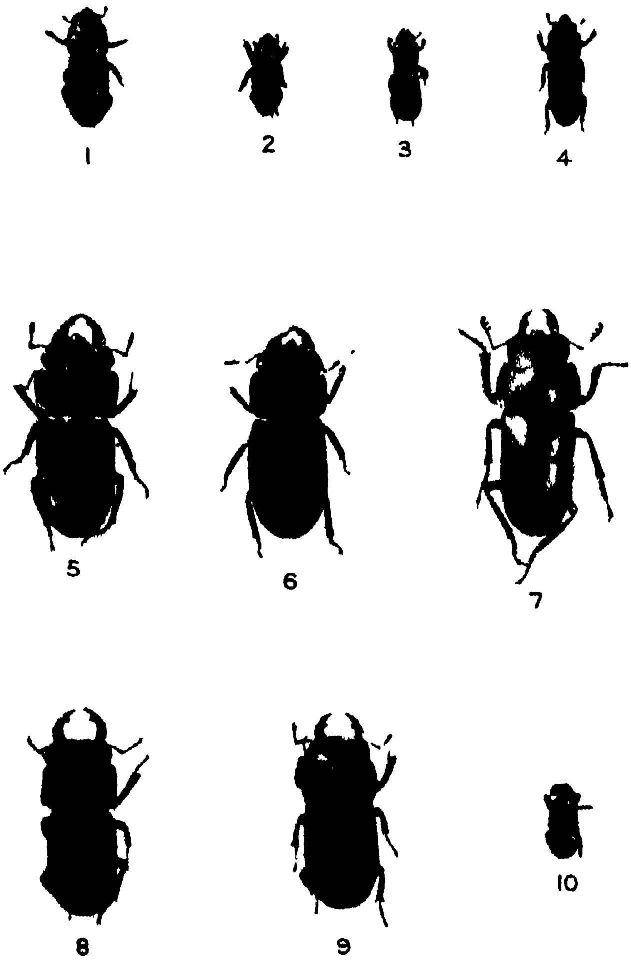

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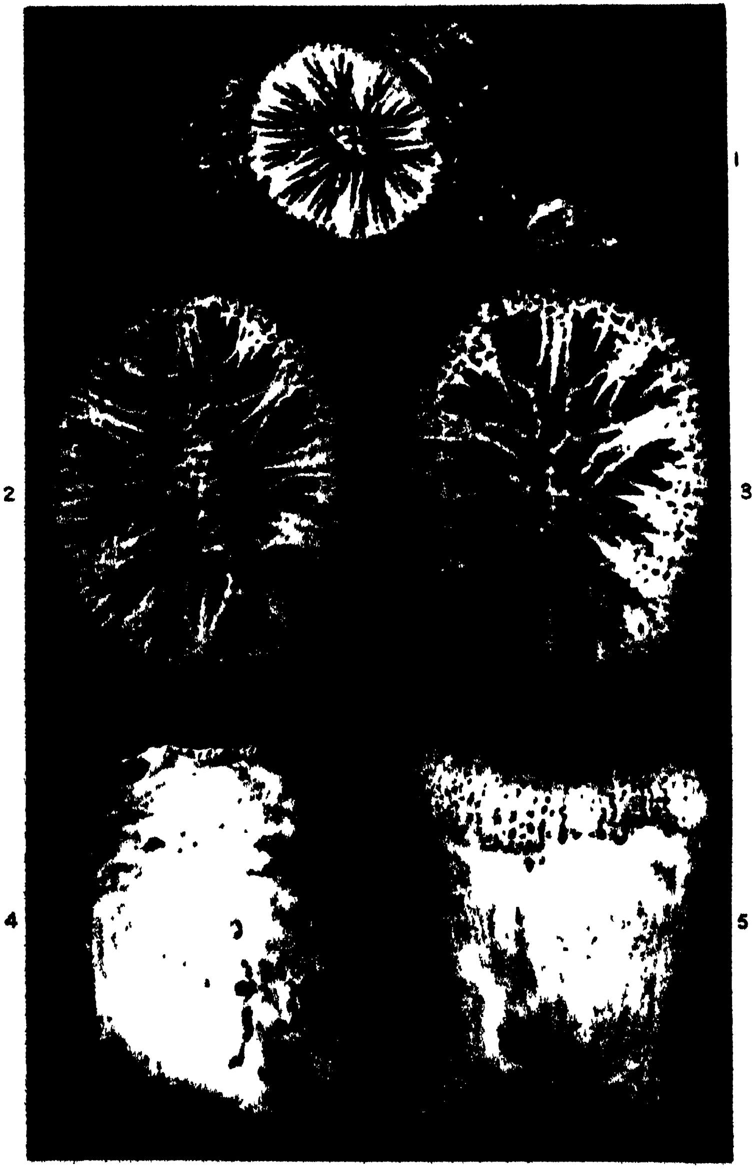

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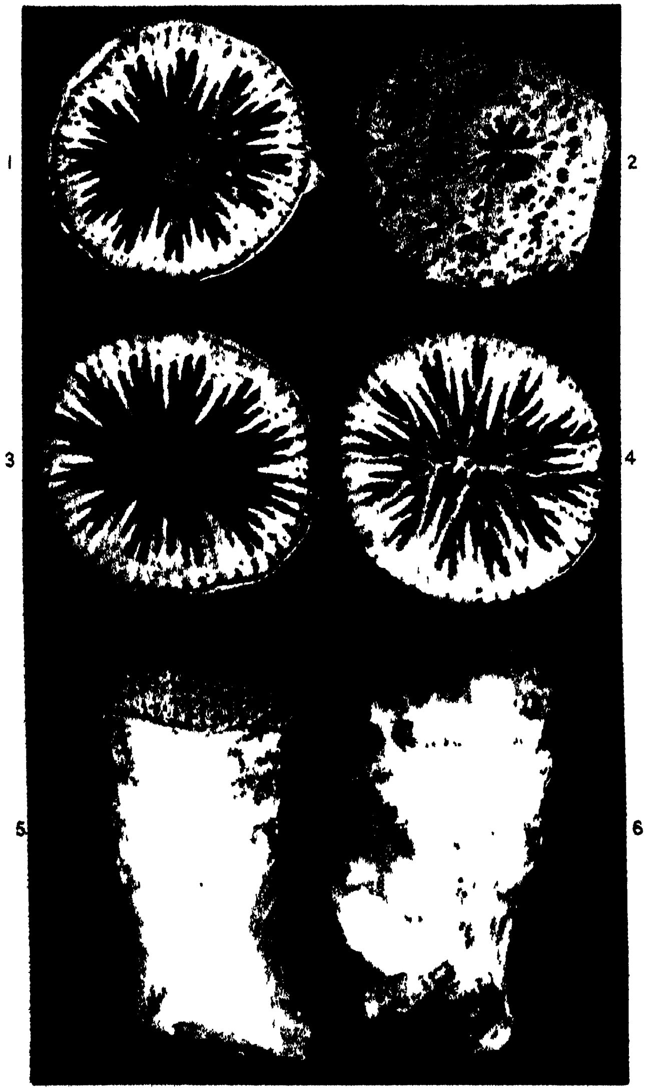

BALANOPHYLLIAS FROM THE CAPE OF GOOD HOPE.

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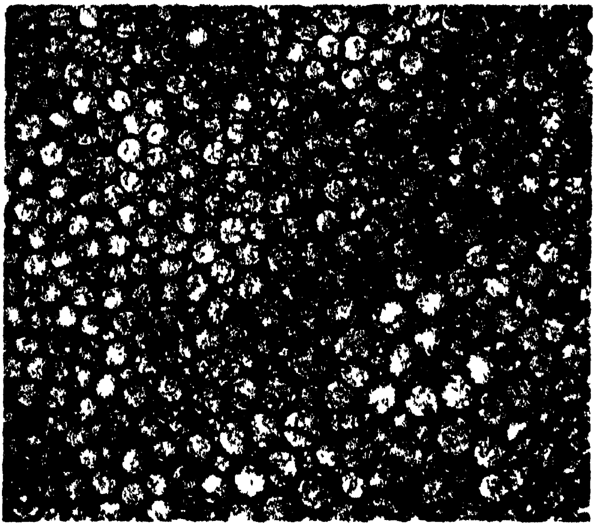
CERAMOPORELLA, SPATIOPORA and ERIDOTRYPA.



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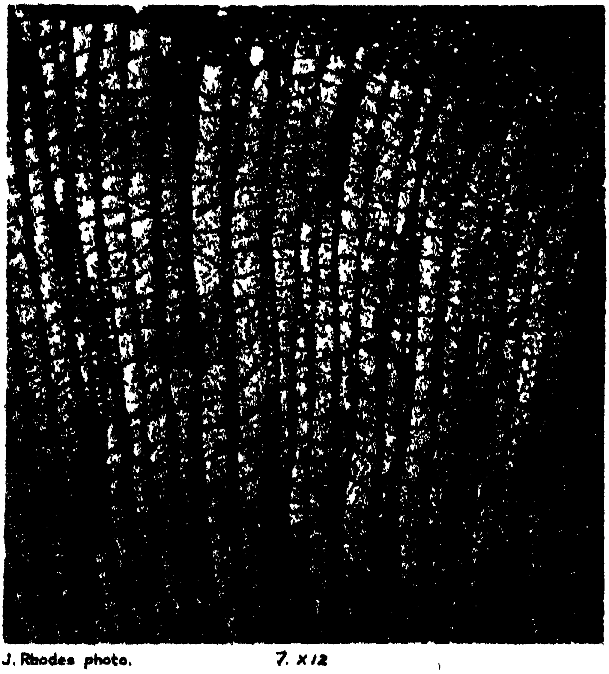

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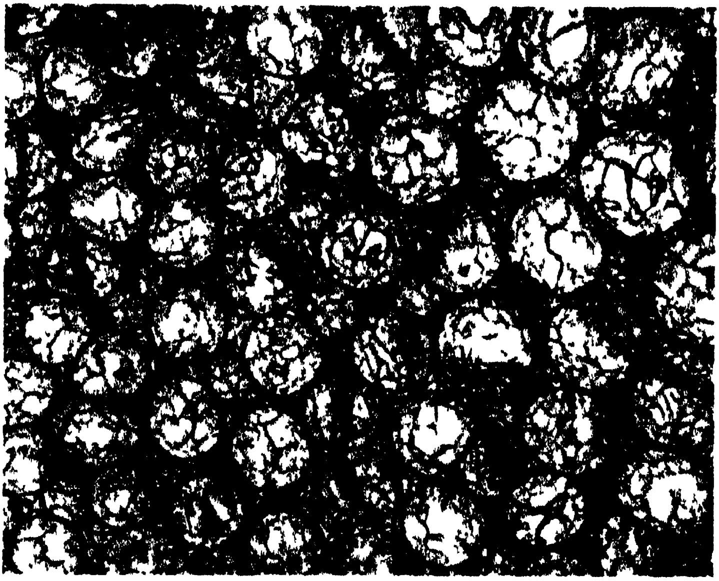
DIPLOTRYPA PETROPOLITANA (PANDER) var. UNGAVA nov.



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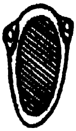

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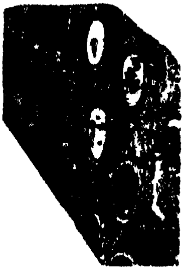

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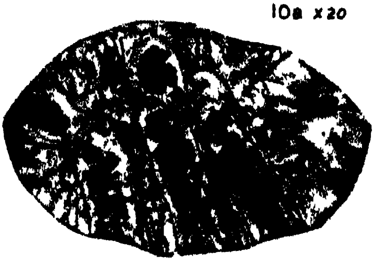

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DIPLOTRYPA PETROPOLITANA (PANDER) var UNGAVA nov and PACHYDICTYA COXI sp nov

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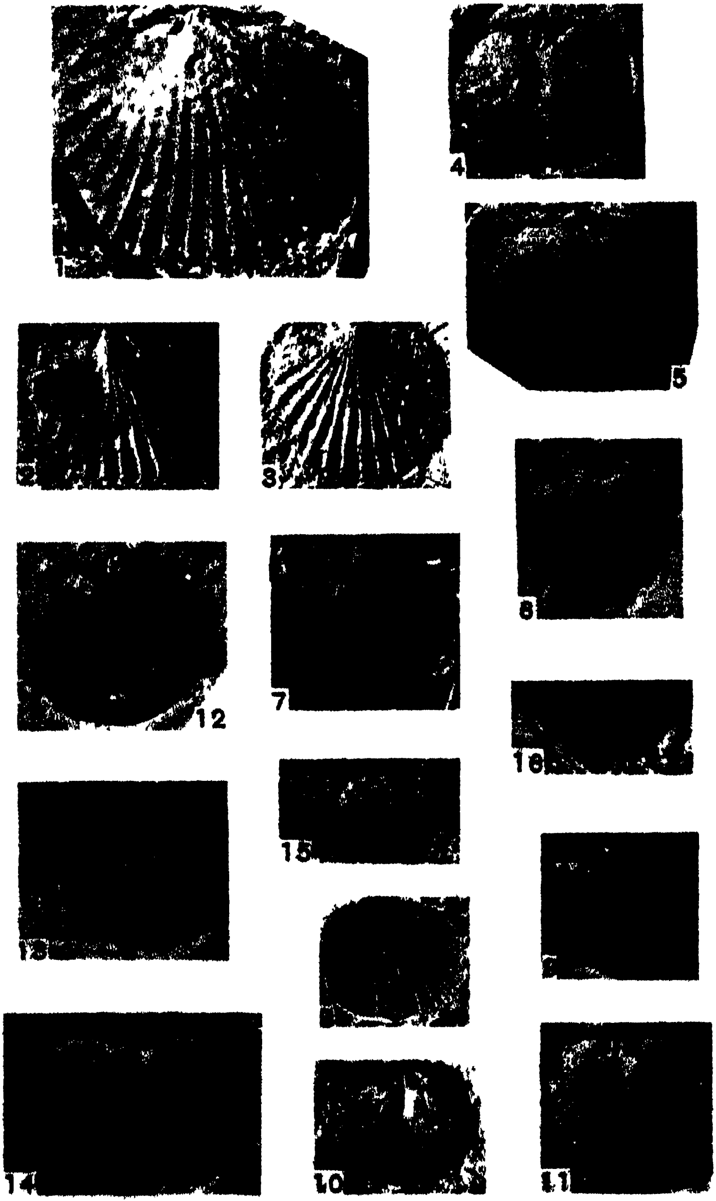

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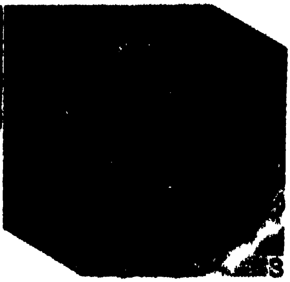

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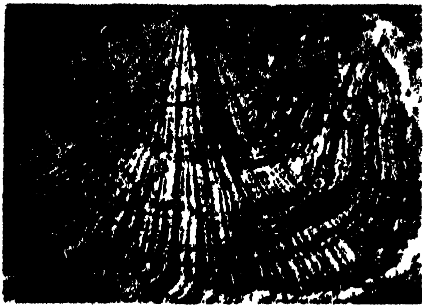

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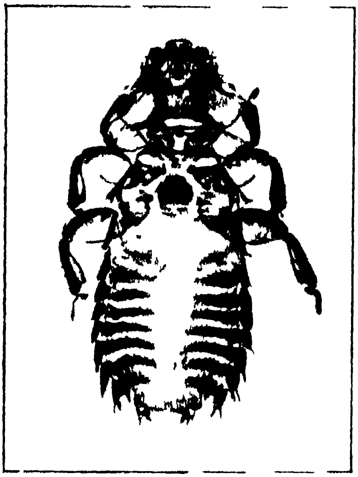

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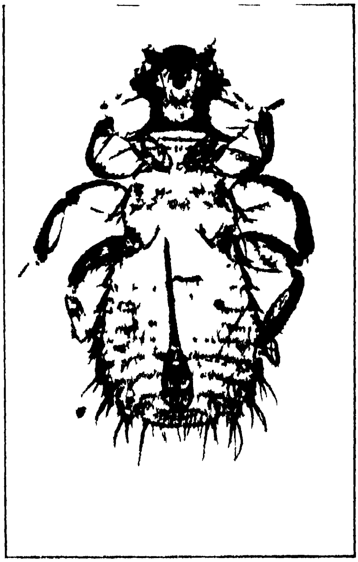
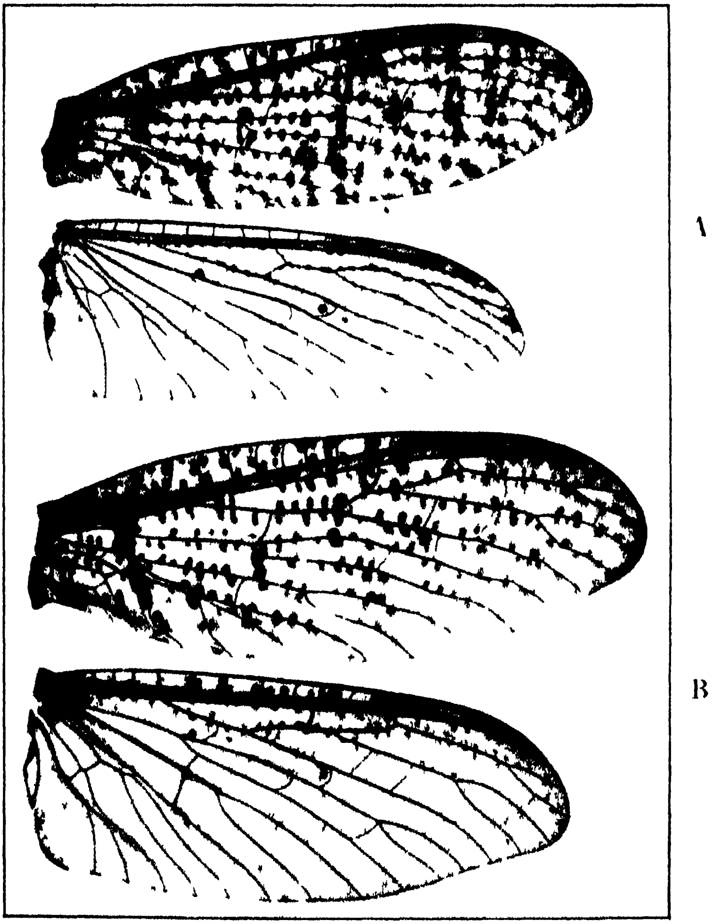


Fig 1 Turacœca scleroderma (Ewing)
Fig 2 Ditto ♂

25 approx



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(A) Wings of Archichauliodes diversus (Walker) ♀
(B) Wings of Protochauliodes dubitatus (Walker) ♂ type

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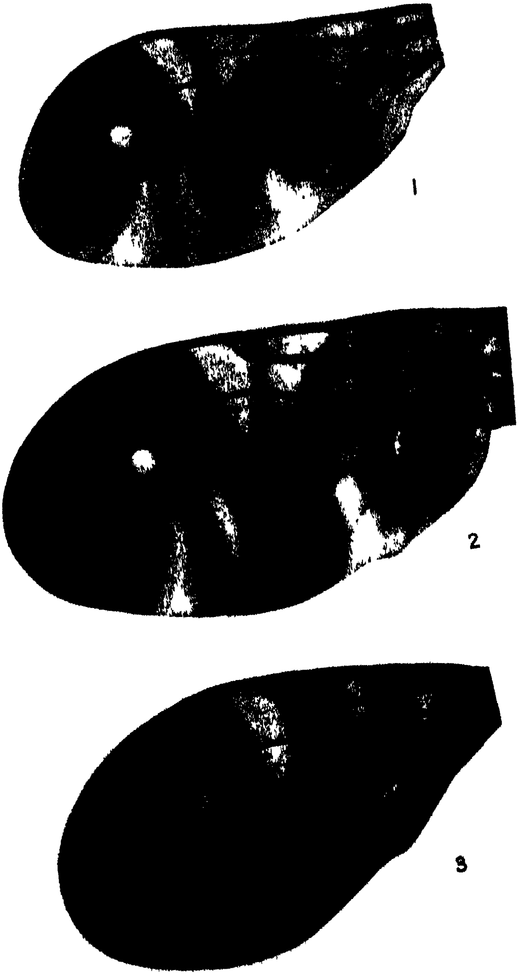


WINGS OF TRYPANEIDAE (DIPT.) FROM BORNEO.

WASHBOURN & JONES

FIG 1

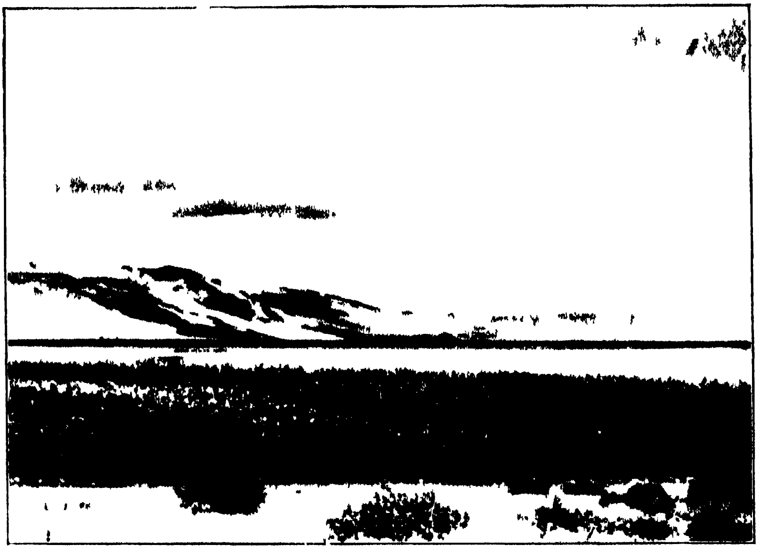


FIG 2

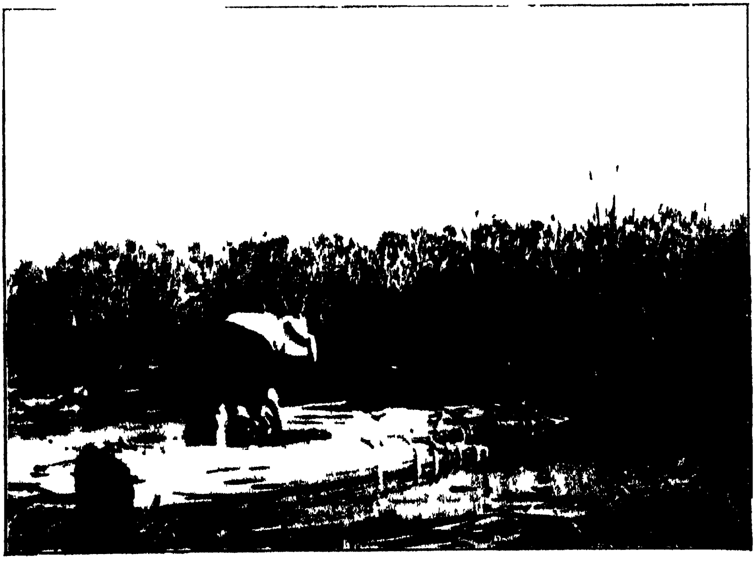
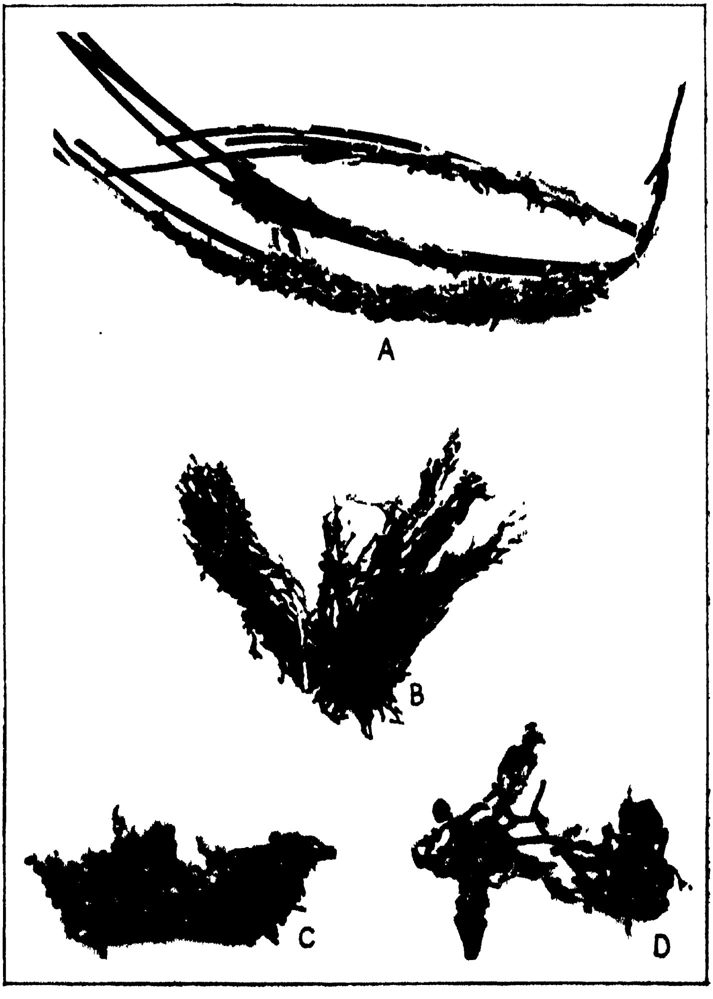
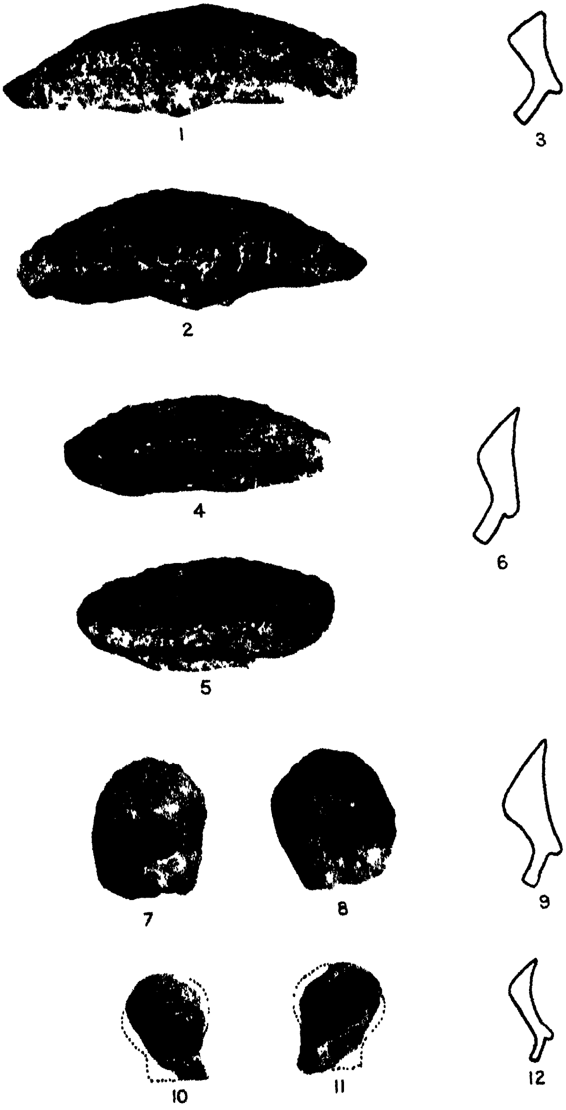


Fig 1—Lake Huleh from the North west shore.
Fig 2—The edge of the swamp, Melaha.



Lake Huleh Polyzoa.



TEETH OF *ANTLIODUS SCOTICUS*, sp. n.

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